

**“War in Space: Why Not?”
A Neorealist Analysis of International Space Politics
(1957-2018)**

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To my wife Leyla,

For your love, patience and support.

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“WAR IN SPACE: WHY NOT?”
A NEOREALIST ANALYSIS OF INTERNATIONAL SPACE POLITICS
(1957-2018)

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ABSTRACT

Why has there never been a space war? The most powerful states on Earth – the US, China, Russia – have all developed anti-satellite weapons (ASATs), but they have never used them to destroy each others satellites. This master thesis in International relations (IR) finds that the distribution of space power in the international system has so far been prone to peace in space, but the distribution is gradually becoming more dangerous. A history of international politics between 1957 and 2018 is analysed using a theoretical framework built on four different neorealist theories. If defined widely, neorealism can include at least defensive neorealism (DN), offensive neorealism (ON), power transition theory (PTT) and hegemonic stability theory (HST). The four theories have much in common, but are divided on the question of war. DN and ON argues that a bipolar balance of power is the safest system and multipolarity the most dangerous. PTT and HST argues that a preponderance of power is the safest and power parity the main threat. Two hypotheses, one for each “camp”, are formulated from the theories and tested against historical evidence on international space politics in the period between 1957 and 2018. The conclusion is that the distribution of space power has been bipolar in the First Space Age and unipolar in the Second Space, but in the underlying components of space power neither the USSR/Russia or China ever reached up to the US. However, China is rapidly catching up with the US both in space power and the underlying components – and so are other powerful states. The distribution of space power In the international system is becoming more multipolar, and a rising challenger is approaching parity with the dominant one. Thus, according to both camps of neorealism, the world is entering a period with higher risk for space war. The thesis aims to be a stepping stone. Even neorealism, a prominent school within the dominant realist paradigm, has rarely been used to analyse international space politics. The goal of the thesis is to fill a gap in the growing IR literature on space and experiment with neorealism to inspire further research on the topic.

KEYWORDS: international relations, international space politics, neorealism, outer space, space, space security, space war, war.

“GUERRA NO ESPAÇO: PORQUE NÃO?”
UM ANÁLISE NEOREALISTA DA POLÍTICA ESPACIAL INTERNATIONAL
(1957-2018)

EIRIK BILLINGSØ ELVEVOLD

RESUMO

Por que nunca houve uma guerra espacial? As Grandes Potências - EUA, China e Rússia - desenvolveram armas anti-satélite (ASATs), mas nunca as utilizaram para destruir os satélites uns dos outros. Esta dissertação de mestrado em Relações Internacionais (RI) visa evidenciar que a distribuição do poder espacial no sistema internacional tem sido até agora propensa à paz no espaço, mas a mesma distribuição tende a tornar-se gradualmente mais perigosa. Uma história da política internacional entre 1957 e 2018 é analisada recorrendo a um quadro teórico construído sobre quatro diferentes teorias neo-realistas. Se amplamente definido, o neo-realismo pode incluir, o neo-realismo defensivo (DN), o neo-realismo ofensivo (ON), a teoria da transição de poder (PTT) e a teoria da estabilidade hegemónica (HST). As quatro abordagens têm muito em comum, mas dividem-se sobre a questão da guerra. DN e ON argumentam que a bipolaridade é a estrutura mais segura e a multipolaridade a mais perigosa. PTT e HST argumentam que uma preponderância de poder permite maior segurança, enquanto que a sua paridade é a principal ameaça. Duas hipóteses, uma para cada “campo”, são formuladas a partir das teorias e testadas contra evidências históricas da política espacial internacional no período compreendido entre 1957 e 2018. A conclusão é que a distribuição do poder espacial foi bipolar na Primeira Era Espacial e unipolar na Segunda, mas a nível de componentes subjacentes ao poder espacial, nem a URSS / Rússia nem a China alcançam os EUA. No entanto, a China – e outras potências - está a alcançar rapidamente os EUA tanto no poder espacial quanto nos componentes subjacentes. A distribuição do poder espacial no sistema internacional tende a tornar-se multipolar, e uma potência desafiante aproxima-se da paridade com o poder dominante. Assim, de acordo com os dois campos do neo-realismo, entramos num período com maior risco de guerra espacial. Esta dissertação pretende funcionar como ponto de partida e “trampolim”. Mesmo o neorealismo, uma escola proeminente dentro do paradigma realista dominante, raramente é utilizado para analisar a política espacial internacional. O objetivo da dissertação é preencher uma lacuna na crescente literatura de RI sobre o espaço, utilizando o neorealismo para inspirar mais pesquisas sobre o tema.

PALAVRAS-CHAVE: espaço, guerra, guerra no espaço, neorealismo, política espacial internacional, relações internacionais, segurança no espaço.

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ABM = Anti-ballistic missile

ABMT = Anti-ballistic Missile Treaty

AFSPC = Air Force Space Command

APSCO = The Asia-Pacific Space Cooperation Organization

ASAT = Anti-satellite weapon

CASC = China Aerospace Science and Technology Corporation

CBERS = China-Brazil Earth Resource Satellite

CD = Conference on Disarmament

COPUOS = The Committee on the Peaceful Uses of Outer Space

CNSA = Chinese National Space Administration

DN = Defensive Neorealism

DOD = The United States Department of Defense

ELV = Expendable Launch Vehicle

ESA = European Space Agency

FOBS = Fractional Orbital Bombardment System

GBI = Ground Based Interceptor

GEO = Geostationary Orbit

GLONASS = Global Navigation Satellite System

GMD = Ground-Based Missile Defense

GNSS = Global Navigation Satellite System

GPS = Global Positioning System

GWIC = Great Wall Industry Corporation

HST = Hegemonic Stability Theory

ICBM = Intercontinental Ballistic Missile

IR = International Relations

IRBM = Interregional Ballistic Missile

ISO = International Organization for Standardization

ISS = International Space Station

ISS = International Space Station

ITAR = International Traffic in Arms Regulations

ITU = International Telecommunication Union

JPL = Jet Propulsion Laboratory

KV = Russia's Space Forces

LEO = Low-Earth Orbit

LM = Long March

MAWs = Missile Approach Warning Systems

MAD = Mutually Assured Destruction

MDA = Missile Defense Agency

MEO = Medium-Earth Orbit

MHV = Miniature Homing Vehicle

MISS = Man in Space Soonest

MOL = Manned Orbiting Laboratory

MTCR = Missile Technology Control Regime

NASA = National Aeronautics and Space Administration

NRO = National Reconnaissance Office

NSC = National Security Council

NSPDs = National Space Policy Directives

ON = Offensive Neorealism

OST = Outer Space Treaty

PAROS = Prevention of an Arms Race in Outer Space

PKO = Protivo Kosmicheskaya Oborona

PLA = People's Liberation Army

PNT = Positioning, navigation and timing

PPWT = Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects

PTT = Power Transition Theory

RF = Radio Frequency

R&D = Research and Design

SALT = Strategic Arms Limitation Talks

SDI = Strategic Defense Initiative

SDIO = Strategic Defense Initiative Organization

SETI = Search for extraterrestrial intelligence

SIGINT = Signals Intelligence

SLBM = Submarine-launched Ballistic Missiles

SLG = Space Leading Group

SLV = Space Launch Vehicle

SSA = Space Situational Awareness

SSF = Strategic Support Force (FSS)

STS = Space Transportation System

TCBM = Transparency and Confidence Building Measures

THAAD = Terminal High Altitude Area Defense

UNGA = United Nations General Assembly

USAF = The United States Air Force

USSR = Union of Soviet Socialist Republics

UN = United Nations

US = United States / American

VKS = Russian Military Space Forces

WWII = Second World War

“War in Space – Why Not?”

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INTRODUCTION

*“You spend even a little time contemplating the Earth from orbit
and the most deeply engrained nationalisms begin to erode.
They seem the squabbles of mites on a plum.”*

– Carl Sagan, Pale Blue Dot.¹

The words of Carl Sagan, an American astronomer, express some of the existing optimism about international politics in outer space. Many view space as a second chance for mankind. They dream of space becoming a sanctuary of peace, safe from the forces that have lead us to kill each other in wars on Earth. According to Sheehan, the idea of a space sanctuary is “as old as the space age itself”², but has space ever actually been a sanctuary? Space cooperation could perhaps mitigate the risks of conflict spreading beyond the atmosphere. The perspective gained from seeing our own planet from the outside could unite our nations, expose our common vulnerability and motivate us to work together for all humanity. This thesis, however, will go on to make the assumption, as a worst case scenario, that we have brought our nationalisms – our “squabbles of mite” as Sagan would say – with us to space.

The main question is: *why have states never fought a war in space?* To answer the question, a neorealist framework is applied to a history of the international space politics. By analysing the distribution of space power among the most powerful states in space over time, some conclusions can be drawn on the causes and likelihood of space war. The thesis is based on three chapters. Chapter I establishes a neorealist theoretical framework for analysing international space politics. Chapter II presents a descriptive international political history of the US, the USSR/Russia and China in space between 1957 and 2018. Chapter III is an analysis of the historical evidence presented in Chapter II using the theoretical framework established in Chapter I. The conclusion is a synthesis of three partial conclusions made at the end of each of the three chapters.

In short, the thesis concludes that the distribution of space power in the international system

¹ Carl Sagan, *Pale Blue Dot: A Vision of the Human Future in Space* (New York: Ballantine Books, 1997), 104.

² Michael Sheehan, *The International Politics of Space* (London: Routledge, 2007), 6.

has been prone to peace so far in the Space Age. In the First Space Age, there was a bipolar space power balance between the US and the USSR. In the Second Space Age, there was a US preponderance of space power. Now, however, the world is facing multipolarity in space. At the same time, China is catching up with the US at the top of the hierarchy. As this thesis will show, four different neorealist theories conclude that the risk of space war is increasing. The causes of space war seem to be largely the same as the causes of major war on Earth. Space power is deeply interlinked with power – especially nuclear power and missile technology. A future war in space is therefore unlikely to occur without a large-scale conflict on Earth – and vice versa.

Space War is a Real-World Scenario

Space has become crucial to our modern way of life. Satellites allow us to link vast distances, gather information, improve education, expand medical resources and create jobs. There would be no internet, no international money transfers, no cheap mobile phone calls, satellite TV or GPS without the thousands of manmade machines circling the planet in space.³ Satellites monitor crop yields to avoid famine, organize large refugee camps, monitor ship traffic, uncover ethnic cleansing and research climate change.⁴ The list of possible applications seems endless.

Space war, however, is still a prospect of science fiction for most people, but a space war could break out tomorrow. A real-world space war scenario would not look like Star Wars. There would not be any colossal spacecraft, fighting each other in far-off galaxies. Nonetheless, the most powerful states on Earth, the United States (US), Russia (formerly the USSR) and China (The People's Republic of China), have already developed and tested counterspace capabilities.⁵ The most important sub-group of counterspace capabilities are anti-satellite weapons, often referred to as ASATs, that can destroy satellites in orbit. A surprising Chinese ASAT test in 2007 – the first test globally since 1985 – created record-breaking amounts of space debris and was quickly countered by another US ASAT test.⁶ The new superpower exchange in space made one thing clear: a space war could ruin the space environment forever.

Weapons have not yet been permanently placed in space, but satellites are actively used in warfare on Earth. Space has been *militarised*, but not yet *weaponised*. Modern armies, navies and air forces use satellites like augmented eyes, ears and voices in the sky. Missiles hit the right target

³ Ibid, 6.

⁴ Ibid, 7.

⁵ Brian Weeden and Victoria Samson, eds, *Global Counterspace Capabilities: An Open Source Assessment* (Washington, D.C.: Secure World Foundation, 2018).

⁶ Laura Grego, *A History of Anti-Satellite Programs* (Cambridge: Union of Concerned Scientists, 2012).

in all types of weather, classified communications are kept secure and intelligence is gathered from enemy territory – all using satellites.⁷ Information – delivered through material space capabilities – is the primary military benefit from space.⁸ It provides “critical war-fighting capabilities”⁹ – military advantages that once seemed unimaginable. Satellite navigation systems like GPS, for example, can be used to track and identify friendly and unfriendly forces, conduct minesweeping operations and convert unguided free-fall bombs into accurate smart bombs.¹⁰ In short, states use space to keep their citizens safe and to project power on the battlefield of the 21st century.

Are We Headed for Space War?

The launch of Sputnik – the first manmade satellite in history – in 1957 triggered a superpower space race between the US and the USSR. According to McDougall, the space race “climaxed with the Moon race, declined with detente, and died when the USSR died”¹¹. After the collapse of the USSR in 1991, the US emerged as the preeminent global space power. Today, the US has the best military space technology, fields the most operational satellites in orbit and leads the global aerospace industry.¹² The Trump administration has launched a plan to establish a US Space Force – after a long-running debate in the US congress and senate – to closer match the military organisation in Russia and China.¹³ Russia still has a place among the top players in space due to unique space capabilities and experience, but still lags behind the US due to “a lost decade in space” in the 1990s.¹⁴

Sixty years after Sputnik, the total number of space actors has grown significantly. China has “moved more quickly in developing a wider range of military space capabilities than any previous spacefaring state”¹⁵, independently achieved human spaceflight, tested ASATs, launched a space station and soon made a global satellite navigation system. Ten states, including France, Japan, India, Israel, Iran, North Korea and South Korea, have now independently developed space

7 Joan Johnson-Freese, *Space as a Strategic Asset* (New York: Columbia University Press, 2007), preface.

8 James C. Moltz, *Crowded Orbits: Conflict and Cooperation in Space* (New York: Columbia University Press, 2014), 13.

9 Johnson-Freese, *Space as a Strategic Asset*, 6.

10 Ibid, 44.

11 Walter A. McDougall, *The Heavens and the Earth: A Political History of the Space Age* (New York: Basic Books, 1985), xvi.

12 Johnson-Freese, *Space as a Strategic Asset*, preface, 6.

13 Helene Cooper, “Pence Advances Plan to Create A Space Force,” *New York Times*, August 9, 2018.

<https://www.nytimes.com/2018/08/09/us/politics/trump-pence-space-force.html>.

14 Igor I. Kuznetsov, “Russian Space Launch Programs,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 777.

15 Peter L. Hays, *Space and Security* (Santa Barbara, California: ABC-CLIO, 2011), 93.

launch capabilities.¹⁶ More than fifty states have operated satellites in space¹⁷, and the total number of operational satellites in orbit is, according to the latest UN estimate, 1.957.¹⁸ The largest satellite in orbit, the International Space Station (ISS), is a joint venture between the US, Russia, the European Space Agency (ESA), Canada and Japan.¹⁹ The number of non-state actors, like companies, universities and international organizations, has also skyrocketed.²⁰

The “unprecedented increase in space faring nations”²¹ is much due to a revolution in information technology.²² The third industrial revolution is based on rapid technological advances in computers, communications, and software that have cut the cost of processing and transmitting information.²³ As a consequence, the technology, skills and knowledge necessary for spaceflight is spreading internationally through companies, trade, migration, education, and the flow of ideas.²⁴ In 2017, a record-breaking space launch painted a clear picture of the new reality in space, when India launched 104 nano-satellites, weighing less than 10 kilograms each, on behalf of private companies from the US, Israel, Kazakhstan, the Netherlands, Switzerland and the United Arab Emirates.²⁵ Shortly after, SpaceX became the first private space launch company to successfully launch and land a reusable space launch vehicle (SLV) twice, raising optimism for cheaper spaceflight in the future.^{26,27}

An international regime from the Cold War is supposed to prevent a space war from happening, but its limits are becoming painstakingly clear. In the Outer Space Treaty (OST) of 1967, states commit to the peaceful uses of space and ban weapons of mass destruction in orbit.²⁸ After the Sputnik launch, the UN established the Committee on the Peaceful Uses of Outer Space

16 Moltz, *Crowded Orbits*, 32.

17 Brian Weeden, “U.S.-China Cooperation in Space: Constraints, Possibilities, and Options,” in *Anti-satellite Weapons, Deterrence and Sino-American Space Relations*, ed. Michael Krepon and Julia Thompson (Washington D.C.: Stimson Center, 2013), 119.

18 “UCS Satellite Database,” *Union of Concerned Scientists*, accessed April 27, 2019, <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WLAqnRKLR-U>.

19 Ibid.

20 Alessandra Vernile, *The Rise of Private Actors in the Space Sector* (Basel: Springer International Publishing, 2018).

21 Anna, Burzykowska, “Smaller states and the new balance of power in space,” *Space Policy* 25, no. 3 (2009): 187, <https://doi.org/10.1016/j.spacepol.2009.05.006>.

22 Johnson-Freese, *Space as a Strategic Asset*, 29.

23 Joseph S. Nye Jr. and David A Welch, *Understanding Global Conflict and Cooperation: An Introduction to Theory and History* (Boston: Pearson, 2011), 268-269.

24 Ibid, 305.

25 Michael Safi, “India launches record-breaking 104 satellites from single rocket,” *The Guardian*, February 2, 2017, <https://www.theguardian.com/science/2017/feb/15/india-launches-record-breaking-104-satellites-from-single-rocket>

26 Chelsea Leu, “Watch SpaceX launch its first truly reusable rocket,” *Wired*, March 30, 2017, <https://www.wired.com/2017/03/watch-spacex-launch-first-truly-reusable-rocket/>

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28 “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,” *United Nations Office for Outer Space Affairs*, accessed April 27, 2019, <http://www.unoosa.org/oosa/en/ourwork/spacelaw/treaties/introouterspacetreaty.html>

(COPUOS), which remains the main arena for international space cooperation.²⁹ However, COPUOS can be a slow bureaucracy, and the OST has no clear rules for conventional weapons.³⁰ The “loophole” came to light when China and US tested ASATs in 2007 and 2008, and in 2019 when India followed suit.³¹ These facts point to the potential usefulness of realism, which explains the failure of international cooperation with fear for relative gains favouring competitors under the insecurity of anarchy.³²

Two analogies – sea power and air power – support the idea that space war is inevitable. As humans took control of those elements, they eventually became battlespaces. Mahan writes of this trend when he concludes that “[t]he history of Sea Power is largely, though by no means solely, a narrative of contests between nations, of mutual rivalries, of violence frequently culminating in war”³³. The inevitability thesis has a prominent place in US, Russian and Chinese perspectives on space weaponization.³⁴ To counter US space dominance, Russia and China have tried to ban space-based weapons while developing military space capabilities. However, the US, described as “extraordinarily dependent on space”³⁵, has protected its rights to defend its own space assets. Simply put, the US has less to gain and more to lose from banning space weapons than Russia and China.

The security dilemma, a term first coined by John Herz, describes “the condition in which states, unsure of one another’s intentions, arm for the sake of security and in doing so set a vicious circle in motion”³⁶. The inherent dual-use nature of space technology seems to suggest just this condition apply to space as well as Earth. Most space assets are considered to be valuable to both the military and the civilian sector.³⁷ Pictures taken by imagery satellites can be used to target weapons *and* monitor crop yields, and a missile defence system on Earth could attack satellites in orbit more easily than incoming missiles.³⁸ The lacking distinction between offensive and defensive

29 Everett C. Dolman, *Astropolitik* (London: Frank Cass, 2002), 128.

30 “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.”

31 Jeffrey Gettleman and Hari Kumar, “India Shot Down Satellite, Modi Says, Shifting Balance of Power in Asia,” *New York Times*, March 27, 2019, <https://www.nytimes.com/2019/03/27/world/asia/india-weather-satellite-missile.html>.

32 Robert Jackson and Georg Sørensen, *Introduction to International Relations: Theories & Approaches* (Oxford: Oxford: University Press, 2010), 116-117.

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34 Columba Peoples, “Assuming the Inevitable? Overcoming the Inevitability of Outer Space Weaponization and Conflict,” *Contemporary Security Policy* 29, no. 3 (2008): 503. <https://doi.org/10.1080/13523260802514811>

35 Michael Krepon, Theresa Hitchens and Michael Katz-Hyman, “Preserving Freedom of Action in Space: Realizing the Potential And Limits of U.S. Spacepower,” in *Toward a Theory of Space Power: Selected Essays*, ed. by Charles D. Lutes and Peter L. Hays with Vincent A. Manzo. Lisa M. Yambrik, and M. Elaine Bunn (Washington, D.C.: Institute for National Strategic Studies - National Defense University, 2011).

36 Kenneth N. Waltz, *Theory of International Politics* (Boston: Addison-Wesley, Longman Higher Education, 1979), 185.

37 Johnson-Freese, *Space as a Strategic Asset*, 6-7.

38 Moltz, *Crowded Orbits*, 31.

weapons, together with the inherent vulnerability of satellites, feed zero-sum approaches and first-strike mentalities to space security.³⁹ In sum, IR theory in general and realism in particular could provide crucial insights that can help us explain space security.

Can IR Theory Explain The Lack of Space War?

A theoretical framework is needed in order to analyse the history of international space politics. IR deals with the likelihood of war between states. However, Walt argues that no single IR approach can “capture all the complexity of contemporary world politics”, so “we are better off with a diverse array of competing idea rather than a single theoretical orthodoxy”.⁴⁰ Walt goes on to describe the boundaries between different IR traditions as “somewhat fuzzy”, but concludes that the study of state interaction is “best understood as a protracted competition between the realist, liberal and radical traditions”.⁴¹ More specifically, constructivism has appeared as the most potent radical challenger to the overlapping mainstream, materialistic theories of realism and liberalism after marxism rendered itself rather marginal in the 1980s.⁴² Constructivism does not, however, “offer a unified a unified set of predictions” on the most important issues of IR.⁴³

As the dominant paradigm of IR, realism has been the natural starting point for building the framework needed for this thesis. Building on a scholarly body dating back several millennia to the writings of Thucydides, prominent realists like Machiavelli, Hobbes, Morgenthau, Kennan, Wight, Bull, Waltz and Mearsheimer have remained pessimistic about the future of international politics.⁴⁴ Realists claim that the security dilemma can be mitigated, but never solved.⁴⁵ They are divided in their answers as to why wars occur, but a few fundamental conclusions about international politics unite them. States are the central actors, and the use of force is the central problem.⁴⁶ Anarchy – the lack of world government – brings insecurity that influences state behaviour, forcing states to seek survival through power politics.⁴⁷ In their opinion, there seems to be an enduring logic to anarchy, meaning, in short, that future wars are inevitable. Anarchy is not equal to a state of constant war, but the risk of war will remain high until an unlikely global government upends anarchy. States will

39 Johnson-Freese, *Space as a Strategic Asset*, 22.

40 Stephen M. Walt, “International Relations: One World, Many Theories,” *Foreign Policy*, no. 110, Special Edition: Frontiers of Knowledge (1998): 30.

41 Ibid.

42 Ibid, 32.

43 Ibid, 41.

44 Johnson-Freese, *Space as a Strategic Asset*, 22.

45 Jackson and Sørensen, *Introduction to International Relations*, 93.

46 Nye and Welch, *Understanding Global Conflict and Cooperation*, 4.

47 Jackson and Sørensen, *Introduction to International Relations*, 93.

always be wary of relative gains because cooperation easily can end up helping the most powerful.⁴⁸

When is there peace? The traditional realist answer is that a balance of power – an equilibrium in the distribution of military capabilities between states or blocks of states – make war too costly.⁴⁹ A disequilibrium in the balance of power, on the other hand, increases the likelihood of war. Classical realists explain international conflict by states' innate desire to dominate others and focus on the moral dilemmas of statesmanship and explicit foreign policy.⁵⁰ Similarly, neoclassical realists seek to explain the foreign policy strategies of individual states.⁵¹ The goal of this thesis, however, is not to explain why an individual state did not go to space war in a specific scenario, but to explain why space war has not been an outcome of international space politics during the entire Space Age.

Structural realism or neorealism explains war as an outcome from the interaction of rational actors trying to position themselves in “an exogenously given obstacle course”⁵². The likelihood of war is explained by the distribution of capabilities that affect state interaction.⁵³ Neorealism, as well as structural strains of liberalism, was born from the attempt to create formal, deductive IR theories modelled on microeconomics in the 1980s.⁵⁴ Waltz's defensive neorealism (DN)⁵⁵ and Mearsheimer's offensive neorealism (ON)⁵⁶ – two structural, realist balance of power theories – hold that international system with a balance of power between only two major powers, bipolar systems, are more safe than multipolar systems with many major powers. Unipolar systems are not considered to be peaceful or stable because they quickly turn into multipolar systems due to balancing behaviour against the most powerful state. However, Wohlforth argues that US unipolarity is stable, peaceful and durable.⁵⁷ Two other strains of structural realism, Organski's power transition theory (PTT)⁵⁸ and Gilpin's hegemonic stability theory (HST)⁵⁹, hold that an international system with one preponderant state is the least war prone and the most stable because the risk of war increased during moments of power parity between great powers with different growth rates. These theories have been included in the analysis on the basis of Taliaferro's

48 Ibid, 116-117.

49 Ibid.

50 Jackson and Sørensen, *Introduction to International Relations*, 44, 75.

51 Jeffery W. Taliaferro, “Security Seeking under Anarchy: Defensive Realism Revisited,” *International Security* 25, no. 3 (2001): 131, <https://doi.org/10.1162/016228800560543>.

52 Craig Parsons, *How to Map Arguments in Political Science* (Oxford: Oxford University Press, 2010), 65.

53 Scott Pace, “How far – if at all – should the USA cooperate with China in space?,” *Space Policy* 27, no. 3 (2011): 127-130.

54 Nye and Welch, *Understanding Global Conflict and Cooperation*, 7.

55 Waltz, *Theory of International Politics*.

56 John Mearsheimer, *The Tragedy of Great Power Politics* (New York: W.W. Norton & Company, 2014).

57 William C. Wohlforth, “Realism and the End of the Cold War,” *International Security* 19, no. 3 (1994-1995): 91-129, doi: 10.2307/2539080.

58 Abramo F. K. Organski, *World Politics*, (New York: Knopf, 1958).

59 Robert Gilpin, *War and change in world politics* (Cambridge: Cambridge University Press, 1983).

argument that “debates within particular research traditions, not debates between them, are more likely to general theoretical progress”⁶⁰. For that purpose, PTT and HST, which are located on the fringe of neorealism, but share core assumptions with DN and ON, could provide useful, contrasting conclusions and predictions.

Liberal scholars, like Keohane and Nye, and constructivist scholars, like Wendt and Finnemore, are the strongest challengers to realists.⁶¹ Both concede that anarchy brings some level of insecurity to international politics, but keep a more positive outlook on the future than realists. Liberalism can be summarized in the following three assumptions: «(1) a positive view of human nature; (2) a conviction that international relations can be cooperative rather than conflictual; and, (3) a belief in progress.»⁶² For constructivists, ideas – not material forces – are the most important structures in IR.⁶³ Snyder argues that “[w]hereas realists dwell on the balance of power and liberals on the power of international trade and democracy, constructivists believe that debates about ideas are the fundamental building blocks of international life”⁶⁴. In sum, liberals and constructivists view international insecurity as a real problem, but one which can be fixed by rational individuals, collective security and international cooperation.

Liberalism and constructivism suggest that space war has been avoided because of a growing interdependence among states, well-crafted institutions, new actors, soft power, spreading norms and changing identities.⁶⁵ In their view, states are happy to cooperate if they can achieve absolute gains.⁶⁶ Liberalism could therefore be fruitful in explaining how international institutions foster space cooperation or the changing role of private space actors. Regime theory could explain how rules and institutions govern complex space activities and the private space economy. Soft power theory could explain how states use space activities to make others want to achieve the same goals as themselves. Similarly, a constructivist approach could open the blackbox in which identities and interests are created and reshaped through international space politics. To paraphrase Wendt, space might be whatever states make of it.

There are several reasons for why neorealist theory still is the most fruitful choice of theory. First of all, there is a wide gap in the existing IR literature on space. The dominant, but largely unused theories of structural realism or neorealism thus seem well suited for a thesis on

60 Taliaferro, “Security Seeking under Anarchy: Defensive Realism Revisited,” 130.

61 Walt, “International Relations: One World, Many Theories,” 32.

62 Jackson and Sørensen, *Introduction to International Relations*, 95.

63 Ibid, 127.

64 Jack Snyder, “One World, Rival Theories,” *Foreign Policy*, October 26, 2009, <http://foreignpolicy.com/2009/10/26/one-world-rival-theories/>.

65 Jackson and Sørensen, *Introduction to International Relations*, 125, 179.

66 Ibid, 116-117.

international space politics or space security. Neorealism can explain how international space politics is shaped by anarchy, insecurity and dual-use space technology.⁶⁷ Space activities seem to be organised around what Dahrendorf has labelled “conflict groups”⁶⁸, in this case nation states, and not the individuals and ideas emphasized in liberalism and constructivism.⁶⁹ The most powerful states on Earth have the most influence in space because weaker states are hindered by the cost of developing and maintaining an advanced military space programs.⁷⁰ The US and China – the two most powerful states on Earth – have little to no cooperation in space.⁷¹ COPUOS has been criticised for being highly ineffective.⁷² The ISS, in spite of being an international joint venture, remains dominated by the US in its decision-making processes.⁷³ Ultimately, military space programs continue to be a priority among the most powerful states.⁷⁴

Problems and Hypotheses

The research question is only a starting point. New problems must be formulated and answered in order to limit and clarify the analysis. Central concepts must be defined. What is a space war? What is space security? Which actors should be studied? In which time period? Furthermore, the relationship between Earth and space must be addressed. Can IR theory, made to study and explain international politics on Earth, be used to study international space politics? Is international space politics exogenous to international politics? Is space part of the international system? What separates space power from power?

The thesis will analyse the most powerful units operating in space and the distribution of space power among them throughout history. Space will be functionally defined as “beginning at the lowest perigee required for orbit and extending out to infinity” because this is the most commonly used definition internationally.⁷⁵ International space politics is defined simply as “international politics related to activities above the lowest perigee for orbit” in order to best explore a still unfamiliar object of study in IR. The dependent variable – space war – is defined per

67 McDougall, *The Heavens and the Earth*.

68 Robert Gilpin, “The Richness of the Tradition of Political Realism,” in *Neorealism and Its Critics*, ed. Robert O. Keohane (New York: Columbia University Press, 1986), 305.

69 Max M. Mutschler, “Security Cooperation in Space and International Relations Theory,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 42.

70 Brian E. Fredriksson, *Globalness: Toward a Space Power Theory* (Maxwell: US Air Force Air University Press, 2006), 36.

71 Pace, “How far – if at all – should the USA cooperate with China in space?,” 127-130.

72 Dolman, *Astropolitik*, 137-138.

73 Johnson-Freese, *Space as a Strategic Asset*, 12-13.

74 Ibid, 23.

75 John J. Klein, *Space Warfare* (London: Routledge, 2014), 6.

Klein as when two or more states overtly destroy each others space assets through offensive action.⁷⁶ Space security is defined according the OST and the Space Security Index as “the secure and sustainable access to, and use of, space and freedom from space-based threats”⁷⁷.

The independent variable will be the distribution of space power between states in the international system. Space power is defined as an actor’s material resources as opposed to its behaviour. The international system is a set of politically interrelated units, and structure describes the configuration of the units. Any person or body whose decisions and actions have repercussions for international politics can be treated as an actor, but realism is mostly concerned with the strongest states.⁷⁸ The state units will be limited to the US, the USSR/Russia and China. The EU, Japan and India are also important states in space, but they have all historically lacked the military space capabilities necessary to wage space war.⁷⁹⁸⁰⁸¹

International space regimes will be defined per Krasner as “sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in a given area of international relations”.⁸² In this case, the given area would be international space politics, ultimately defining international space regimes as sets of implicit or explicit principles, norms, rules, and decision-making procedures around which actors' expectations converge in international space politics.

The time scope of the thesis is limited to the period in which humans have been materially present in space, most commonly known as the Space Age. Thus, the historical analysis will be limited to the years between 1957 and 2018. The starting point – 1957 – is chosen because the Space Age began when the USSR launched the first satellite, Sputnik I, in 1957. The end point, 2018, is chosen as the last full calender year before the delivery of the thesis. The Space Age will be further divided in two separate periods per Hays and Lutes⁸³, Harding⁸⁴ and Cremins⁸⁵. The First Space Age (1957-1991), from the Sputnik launch the fall of the USSR and the Gulf War, and the Second Space Age (1991-) both have distinct features and “offers signposts that point to potential

76 Ibid, 35.

77 Jessica West, ed., *Space Security Index 2016* (Kitchener: Pandora Print Shop, 2016).

78 Nye and Welch, *Understanding Global Conflict and Cooperation*, 37.

79 Robert Harding, *Space Policy in Developing Countries*, (Abingdon: Routledge, 2013), 66.

80 Christina Giannopapa, “Space Security Programs Worldwide: An Introduction,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 720-721.

81 Sheehan, *The International Politics of Space*, 11, 88.

82 Stephen D. Krasner, “Structural Causes and Regime Consequences,” *International Organization* 36, no. 2 (1982): 186, <https://doi.org/10.1017/S0020818300018920>.

83 Peter L. Hays and Charles D. Lutes, “Towards a Theory of Space Power,” *Space Policy* 23, no. 4 (2007): 206-207, <https://doi.org/10.1016/j.spacepol.2007.09.003>.

84 Harding, *Space Policy in Developing Countries*, 17.

85 Thomas E. Cremins, “A New Space Age: Maximizing Global Benefits,” *World Economic Forum*, 2014, <http://reports.weforum.org/global-strategic-foresight/thomas-e-cremins-nasa-a-new-space-age/>.

space ages of the future”⁸⁶.

The research problem can now be reframed more precisely: *Why has space war not been an outcome of international space politics between 1957 and 2018? Why have the US, the USSR/Russia and China not overtly destroyed each others space assets through offensive action between 1957 and 2018?* Realist, structural theories of IR will help answer these questions. Four neorealist theories – DN, ON, PTT and HST – present two opposing conclusions on the likelihood of war Earth. They disagree on whether a bipolar balance of power or a preponderance of power makes for the safest system, and these conclusions will serve as hypothesis going forward. Thus, the first neorealist hypothesis is that *a bipolar balance of space power in the international system has decreased the risk of space war*. The second neorealist hypothesis is that *a preponderance of space power in the international system has decreased the risk of space war*.

Approach, Methodology and Limitations

To test the two neorealist hypotheses, theoretical concepts from a widely defined neorealism will be used in a pluralist historical analysis of empirical evidence in the form of primary and secondary sources. Four theories associated with neorealism, divided in two camps on the question of war, have been included to show various sides of the problems confronted, provide alternative paths for further research and hopefully give the reader a chance to make independent reflections and conclusions.

A theory of analytical eclecticism will inform the general approach to the social sciences in order to combine the four neorealist theories. Analytical eclecticism as defined by Sil and Katzenstein has three important features.⁸⁷ First, it is consistent with an ethos of pragmatism in seeking engagement with the world of policy and practice. Second, it formulates problems that are wide in scope to more closely approximate the messiness and complexity of concrete dilemmas facing actors in the real world. Third, in exploring these problems, eclectic approaches offer complex causal stories that extricate, translate, and selectively recombine analytic components—most notably, causal mechanisms – from explanatory theories, models, and narratives embedded in competing research traditions like DN, ON, PTT and HST.

⁸⁶ Hays and Lutes, “Towards a theory of space power,” 206-207.

⁸⁷ Rudra Sil and Peter J. Katzenstein, “Analytic Eclecticism in the Study of World Politics: Reconfiguring Problems and Mechanisms across Research Traditions,” *Perspectives on Politics* 8, no. 2 (2010): 411, <https://doi.org/10.1017/S1537592710001179>.

The methodology of the thesis will be historical and both qualitative and quantitative in nature. The causal explanation will rest on the verbal presentation of the argument, but figures on for example ASAT tests, satellites launches and space budgets will serve to illustrate the verbal presentation. According to Berkhofer, history can be inferred from such things as manuscripts, monuments, and other material objects that exist in the present, but have been accepted as survivals from previous times.⁸⁸ Sources, distinguished between primary and secondary sources, provide the evidence for the historians own representations of the past.⁸⁹ Primary sources are those documents and other things both from and about the times being investigated. Secondary sources are those referring to matters and times earlier than their own time of production.⁹⁰ Due to the general unavailability of unclassified primary sources on military space activities and the limited scope of this project, secondary sources – like history books, reports and scientific journals – will be the foundation of the main findings. However, primary sources like policy documents, white papers and treaties have been included when possible and fitting.

Thies' guidelines for qualitative historical analysis in IR will help minimise investigator bias and unwarranted selectivity in the research.⁹¹ Thies recommends to get to know your cases well to avoid the inaccuracies in interpretation and evidence that often come with a failure to fully examine the literature. Historians should triangulate by using a variety of types of sources to produce a more accurate representation of history, but avoid actively searching confirmation for their theory. Furthermore, historians should be aware of implicit or explicit presentism in another historian's monograph, of those claiming to simply be reporting the facts, and potential influences of political, organizational, and disciplinary culture on a historian's work. Suspicious documents should be avoided. Documents should be evaluated to reveal the actors, their intentions, interactions and context. The limits on historical evidence from the context provided by the historian must be recognized. Ultimately, the goal is to produce a "history based on a selective, critical reading of sources that synthesizes particular bits of information into a narrative description or analysis of a subject"⁹².

Limitations in the form of access to sources, language skills and precise budget comparisons have restrain the findings of the thesis. As mentioned, classified information, especially on military space capabilities, is a significant and well-known hurdle. In addition, lacking knowledge of the Russian and Chinese language will lead to relatively better access to US sources, but this bias has

88 Robert Berkhofer, *Fashioning History* (New York: Palgrave Macmillan, 2016), 3.

89 Ibid, 11.

90 Ibid, 19.

91 Cameron G. Thies, "A Pragmatic Guide to Qualitative Historical Analysis in the Study of International Relations," *International Studies Perspectives* 3, no. 4 (2002): 351-372, <https://doi.org/10.1111/1528-3577.t01-1-00099>.

92 Ibid, 351.

been consciously mitigated by including a varied set of sources. Ultimately, comparing space capabilities and space budgets is a daunting task, but some key quantitative comparisons have been included (*See Figure 1*). Especially in China's case, budget comparison “is problematic because of currency conversion issues with the Chinese renminbi, labor wage differentials, and the fact that the Chinese space program is highly integrated with the military and thus subject to the secrecy that accompanies such an association”⁹³. Luckily, China's five-year space white papers have “become an important window for outside world to understand China’s space policy and progress in space activities”⁹⁴. The goal has been to analyse the research problem from relevant perspectives using the best possible sources, but the end result could still face legitimate criticism for being western-centric.

The methodological pluralism and pragmatic, eclectic approach will underpin a theoretical framework mixing and comparing concepts from various neorealist IR theories. The framework will be used in a qualitative and quantitative historical analysis of international politics in the First and Second Space Age. The goal of the thesis is, to the extent possible, to address and focus on the real-world issue of space security. By using a neorealist framework supporting explanation as causation⁹⁵, historical patterns in the distribution of space power in the international system could help explain, at least partially, the causes of space war and space security in international space politics.

Outline of the Thesis

The thesis is divided in an introduction, three main chapters, and a conclusion. The first chapter establishes a neorealist analytical framework for international space politics. The second chapter presents a history of international space politics. The third chapter contains the actual neorealist analysis of why there has been no space war in the history of international space politics.

Chapter I establishes a theoretical framework for international space politics. The chapter is divided in four subchapters. First, a crash course on international space politics gives an overview of space geography, space power, space actors, and space regimes. Second, a literature review divided between studies discussing several IR paradigms and those using realism, liberalism, and constructivism. Third, concepts and conclusions from Waltz’s defensive neorealism (DN) and

93 Harding, *Space Policy in Developing Countries*, 99.

94 Rongping Mu and Yonggang Fan, “An Overview of Chinese Space Policy,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 422.

95 Berkhofer, *Fashioning History*, 55.

Mearsheimer's offensive neorealism (ON) are extrapolated to formulate the first neorealist hypothesis, that a bipolar balance of space power in the international system has decreased the risk of space war. Fourth, concepts and conclusions from Organski's power transition theory (PTT) and Gilpin's hegemonic stability theory (HST) are similarly extrapolated to formulate the second neorealist hypothesis, that a preponderance of space power in the international system has decreased the risk of space war. The fifth subchapter is the first partial conclusion. It makes the final case for using a theoretical framework built on four different neorealist theories.

Chapter II presents a history of international space politics in the First Space Age and the Second Space Age. The chapter is divided in four subchapters. The histories of the US, the USSR/Russia and China are presented in separate subchapters. Each state has been given one section for historical context, one for the First Space Age, and one for the Second Space Age. The US has went from being second in space to becoming the only space superpower. The USSR was initially the most powerful state in space before it collapsed in the early 1990s. Now, China is rapidly gaining ground on the US, while Russia is gradually recovering in the field of military space. The fourth subchapter is the second partial conclusion. It argues that IR theory can be used to analyse international space politics because the history of international space politics is very similar to the history international politics.

Chapter III is a neorealist analysis of space war in the First and Second Space Age. The chapter, which is meant to determine whether the first and second neorealist hypotheses are correct, is organised in five subchapters. The four first subchapters are separate neorealist analyses. The first neorealist analysis, based on DN and ON, concludes that a bipolar balance of space power decreased the risk of space war in the First Space Age. The second neorealist analysis concludes that the risk of space war decreased because the USSR never reached parity with the US in the underlying components of space power in the transition between the First and Second Space Age. The third neorealist analysis argues that a unipolar balance of space power and its underlying components decreased the risk of space war in the Second Space Age. The fourth neorealist analysis concludes that China seems more likely than the USSR to reach complete power parity with the US during the ongoing space power transition between Second and Third Space Age. The fifth subchapter is the third partial conclusion. The core argument of the partial conclusion is that the distribution of space power so far in the Space Age has been prone to peace, but that the world is heading towards a more dangerous balance of space power in the international system.

The conclusion is a synthesis of the three partial conclusions of the thesis. It provides three different answers to the research question. First, a neorealist analytical framework has proved that it

can capture the essence of international space politics. However, competing theories show great potential, especially since a structural theory like neorealism reduces complex phenomena to simple concepts. Second, a history of international space politics between 1957 and 2018 has revealed that international politics in space and on Earth are deeply connected. The causes of space war are closely related to the causes of war. Third, a neorealist analysis has concluded that the distribution of space power has been prone to peace so far in the Space Age. However, further research is needed on the causes of war, security and peace in space.

CHAPTER I

A Theoretical Framework for International Space Politics

*“Our visions of space and of our role and purpose
in the cosmos are as varied as individuals themselves
and include ideas as sweeping, extreme, and contradictory
as universal peace and total domination.”*

– Peter Hays, Space and Security.⁹⁶

Chapter I will establish an analytical framework that will be used in Chapter III to analyse the historical evidence presented in Chapter II. In order to analyse international space politics, a theoretical framework is needed. According to Waltz, the realm of international space politics must be isolated using a mental picture – a simplified representation – to deal with it intellectually.⁹⁷ Furthermore, Waltz argues, a paradigm is needed as a “handbook” for the conceptual toolkit of the thesis.⁹⁸

The first chapter is organised in five subchapters, each of them containing several sections. First, international space politics is presented through an overview – a crash course – of space geography, space power, space actors, and space regimes. Second, a literature review brings the reader up to date on the state of the art. The literature review is structured around authors discussing several IR paradigms, and those applying realist, liberalist and constructivist theories. Third, the concepts of defensive and offensive neorealism (DN+ON) are extrapolated to formulate the first neorealist hypothesis: that a *bipolar balance of space power in the international system has decreased the risk of space war*. Fourth, concepts from power transition theory and hegemonic stability theory (PTT+HST) are similarly extrapolated to formulate the second neorealist hypothesis: that a *preponderance of space power in the international system has decreased the risk of space war*. Thus, four theories are divided in two camps on the question of space war, disagreeing on whether a bipolar balance of space power or a preponderance of space power in the international system will decrease the risk of space war and increase space security. The fifth and ultimate subchapter is the first partial conclusion of the thesis. It makes the case for going forward with a widely defined neorealism. In short, the argument of the first partial conclusion rests on the

⁹⁶ Hays, *Space and Security*, 1.

⁹⁷ Kenneth N. Waltz, “Neorealism: Confusions and Criticisms,” *Journal of Politics and Society* 15, no. 1 (2004): 2.

⁹⁸ Nye and Welch, *Understanding Global Conflict and Cooperation*, 55.

the fact that IR theory has proved applicable to international space politics in the past, and that a widely defined neorealism, mixing both concepts and conclusions from two opposing camps, seems best suited to explain why there has never been a space war.

1.1 Crash Course: International Space Politics

Where does space begin? Where does it end? How does it work? Who operates there? And how do they operate? Still today, space is a largely unknown, unfamiliar and mysterious place – even to experts. The first subchapter of Chapter I, divided in four sections, therefore outlines the basics of space in order to build a theoretical framework for international space politics.

The first section deals with the geography of space. In the second section, a range of public and private space actors are presented – states being the most powerful and most important. Third, the concept of space power is defined as material capabilities like launchers, satellites and space weapons. In the fourth and last section, the most important international space regimes – in the shape of treaties and organisations – are presented to the reader.

1.1.1 Space Geography

Space begins “at the lowest perigee required for orbit and extending out to infinity”⁹⁹. The environment of space, characterised by a hard vacuum, high levels of radiation and very low temperature, is extremely harsh to humans.¹⁰⁰ Without protection from advanced and expensive technology, like spacecrafts and space suits, humans loose consciousness within seconds and die within minutes. Since aerodynamic principles cannot be exploited, the energy expenditures of operating in space are many times greater than on Earth.¹⁰¹

There is no clear boundary where space begins. The Kármán line, located at an altitude of 100 kilometres above sea level, is the lowest altitude capable of supporting unpowered orbit and therefore used as a jurisdiction line in international law.¹⁰² Keeping with this legal definition, space is defined in the thesis per Klein as “beginning at the lowest perigee required for orbit and extending out to infinity”¹⁰³. Objects which are launched into space and placed in orbit end up in

99 John J. Klein, *Space Warfare* (London: Routledge, 2014), 6.

100 Andrew A. Pilmanis and William J. Sears, “Physiological Hazards of Flight at High Altitude,” *The Lancet* 362, no. 1 (2003): 16-17, PMID: 14698113.

101 M. V. Smith, *Ten propositions regarding spacepower* (Maxwell: US Air Force Air University Press, 2002), 38.

102 Dolman, *Astropolitik*, 60.

103 Klein, *Space Warfare*, 6.

“regular, unceasing motion around the entire globe on a regular basis”¹⁰⁴. Klein argues that even though “space in fact includes much more than just near-earth orbits, at present this is where most of our interests in space lie”¹⁰⁵.

Geopolitical scholars like Dolman¹⁰⁶, Al-Rodhan¹⁰⁷, McDonald¹⁰⁸ and Duvall¹⁰⁹ are at the forefront of developing a theoretical body suited for the studying states international space politics. Dolman, especially, is praised for his contributions to the study of geopolitics in space, but is criticised for mixing theory and ideology in his research and simply wanting to maximize US hard power. Dolman has, in short, advocated that the US should seize control of space and enforce free-market principles as a benign hegemon.¹¹⁰ Furthermore, he has criticized the current space legal regime for not stimulating competition and commerce in space¹¹¹ and criticized COPUOS for conducting “sterile exchanges of pious internationalist rhetoric”¹¹².

One purpose of the thesis is to consider how IR theory holds up in an analysis of international space politics. Geopolitical space theory, or astropolitical theory, will therefore not be treated as an independent IR paradigm. The justification for the exclusion is twofold.¹¹³ First, the scope of the thesis does not allow including a sufficient coverage of the geopolitical debate. Second, the history of geopolitics as an academic subject sets it apart from the realist paradigm of IR. Some useful concepts, however, will be borrowed, like Dolman's four distinct astropolitical regions.

In his book *Astropolitik*, Dolman divides space into the four distinct astropolitical regions *Earth*, *Earth space*, *Moon space* and *Solar space*.¹¹⁴ *Earth* includes everything between the surface of the Earth and the Kármán line at 100 kilometres. All human space launches going to or from space must go through the Earth. Space launches, command and control, tracking, data downlink, R&D, production, anti-satellite activities, and service, repair and storage operations are performed on the surface of the Earth.

Earth space, which stretches from the Kármán line to about 36,000 kilometres, is the natural

104 Howard, Kleinberg, “On War in Space,” *Astropolitics* 5, no. 1 (2007): 1-27, <https://doi.org/10.1080/14777620701544600>.

105 Klein, *Space Warfare*, 8.

106 Dolman, *Astropolitik*.

107 Nayef R. F. Al-Rhodan, *Meta-Geopolitics of Outer Space: An Analysis of Space Power, Security and Governance* (New York: Palgrave Macmillan, 2009).

108 Fraser MacDonald, “Anti-Astropolitik — Outer Space and the Orbit of Geography,” *Progress in Human Geography* 31, no. 5 (2007): 592-615, <https://doi.org/10.1177/0309132507081492>.

109 Jonathan Havercroft and Robert Duvall, *Critical Astropolitics* (London: Routledge, 2009).

110 Johnson-Freese, *Space as a Strategic Asset*, 134-135.

111 John Hickman and Everett C. Dolman, “Resurrecting the Space Age: A State-Centered Commentary on the Outer Space Regime,” *Comparative Strategy* 21, no. 1 (2002): 1-20, <https://doi.org/10.1080/014959302317350855>.

112 Dolman, *Astropolitik*, 137-138.

113 The same arguments justify the lack of in-depth deterrence theory in the thesis.

114 Dolman, *Astropolitik*, 59-60.

habitat for the military's most advanced reconnaissance and navigation satellites and space-based weaponry. *Earth space* can further be divided into three satellite orbits (See Figure 10): *Low-Earth Orbit* (LEO) at about 2,000 kilometres, *Medium-Earth Orbit* (MEO) at about 10,000 kilometres and *Geostationary Earth Orbit* (GEO) at about 35,800 kilometres. *Moon space* is the region from GEO to just beyond the orbit of the Earth's moon, while *Solar space* consists of everything within our solar system beyond that point. Space is proven to have its own lines of communication, common routes, choke points, and critical nodes.¹¹⁵ For instance, the Earth lies at the bottom of a gravity well which spacecraft can escape by reaching orbit.¹¹⁶ The interactions between states in *Earth space* and on *Earth* will be the central focus of the analysis, because these are the regions of space in which states primarily operate.

In short, space can be defined as everything above 100 kilometres from the surface of the Earth. Space is further divided into various regions and orbits. The closest region, which Dolman calls *Earth space*, is currently the most important in the study of international space politics.

1.1.2 Space Actors

States are the most important space actors. They possess the most space capabilities, invest the most money in space research and have authority over and responsibility for national private space actors like companies, non-governmental organizations (NGOs) and universities. During the Cold War, the US, and the USSR dominated international space politics. Today, after the USSR collapsed, the US is the dominant space actor (See Figure 1, Figure 3, Figure 5, Figure 6, Figure 7 and Figure 8). However, the US is facing challenges to its hegemony from China and others. Since the beginning of the Space Age in 1957, the number and type of space actors have increased due to the proliferation and decreasing costs of space capabilities and market growth, much due to the information revolution or third industrial revolution. Space is now home to international conglomerates, private companies as well as universities.

Space actors can be divided in developed space actors (DVSAs) and emerging space actors (EMSAs).¹¹⁷ DVSAs include the US and the USSR/Russia, which dominated space during the Cold War, as well as the United Kingdom (UK), France, the European Union (EU) and Japan. EMSAs include all the space actors that do not rank among the the DVSAs. Harding has proposed to divide EMSAs into first, second and third tier states based on their advancement.¹¹⁸ The first tier states, China, Brazil and India, have national space programs derived from ballistic missile and nuclear

¹¹⁵ Kleinberg, *On space war*, 22.

¹¹⁶ McDonald, *Anti-Astropolitik*, 599.

¹¹⁷ Harding, *Space Policy in Developing Countries*, 74.

¹¹⁸ Ibid, 14.

programs and their own national space agencies. Furthermore, these states can produce space technology autonomously and launch their own orbital and geosynchronous satellites. The second tier states, Iran, Israel, South Africa and Iraq, can produce some of their own space technology, have national space agencies and basic launch capacity, and often produce space technology in cooperation with advanced states. The third tier states include a large group of smaller players that occasionally contribute to space technology, but rely heavily on more developed states to achieve their space policy goals.

Three space actors, namely the US, Russia, and China, stand out as the most powerful in the military realm of space. The US and Russia are the two archetypical DVSAs, but China has quickly developed a full range of space capabilities typically found only in DVSAs, and is therefore the space actor closest to shedding its “emerging” classification.¹¹⁹ According to Hays, China's space capabilities are now “parallel to those of the US in all mission areas except for space-based missile launch detection”¹²⁰. Meanwhile, as mentioned above, several notable DVSAs – primarily the UK, France, the EU and Japan – has never wielded sizeable military space capabilities.^{121 122 123}

In short, the number and types of space actors have increased over the course of the Space Age. However, states are still the dominant actors in international space politics. Three states with comparable space capabilities – the US, Russia and China – are considered to be the most powerful actors in international space politics.

1.1.3 Space Power

What is space power? There is an ongoing effort among scholars, experts and analysts to answer the question, but the effort has not yet resulted in any clear consensus. However, there seems to be unison agreement that states need space power in order to access, operate in and benefit from space. Since technology is a “critical cornerstone of space travel, and hence, of space warfare”¹²⁴, power will be defined in terms of material capabilities instead of behaviour. Thus, space power is defined per Krepon, Hitchen and Katz-Hyman as “the total sum of capabilities that contribute to a [state's] ability to benefit from the use of space”¹²⁵.

Space power rests on material capabilities that make spaceflight – ballistic flight into or through space – possible. To overcome the gravity of the Earth, all spaceflight normally begins with

¹¹⁹ Ibid, 81.

¹²⁰ Hays, *Space and Security*, 93.

¹²¹ Harding, *Space Policy in Developing Countries*, 66.

¹²² Giannopapa, “Space Security Programs Worldwide: An Introduction,” 720-721.

¹²³ Sheehan, *The International Politics of Space*, 11, 88.

¹²⁴ Klein, *Space Warfare*, 23.

¹²⁵ Krepon, Hitchens and Katz-Hyman, “Preserving Freedom of Action in Space.”

a rocket launch.¹²⁶ A rocket that can be used to carry a payload, like an artificial satellite, into space is called a space launch vehicle (SLV).¹²⁷ SLVs normally need two or three stages of engines and propellants, a liquid or solid mix of fuel and oxidizer, to generate enough thrust to achieve vertical motion, overcome gravity and carry payloads into orbit.¹²⁸ The first and most powerful stage lifts the SLV from the Earth, before falling back to the ground or the ocean. The second stage carries the rocket into space. The final stages release and position the payloads in the correct orbit. All states want launch sites, or spaceports, located as close as possible to the Earth's equator, where the rotational spin of the Earth makes it possible to save fuel consumption.¹²⁹

Spaceflight is often associated with astronauts, but sending humans to space is not the most useful way for states to benefit on a daily basis. Human spaceflight is a complex activity that can generate enormous prestige, but still remains a relatively rare phenomenon due to the harsh climate of space. Exposing a human to excessive gravitational changes and extreme temperatures, while guaranteeing oxygen and food supply and handling waste, involves high costs and risks.¹³⁰ Only three states – the USSR/Russia, the US and China – have independently achieved human spaceflight.¹³¹ In 1961, the Russian cosmonaut Yuri Gagarin became the first human ever to travel in space. Today, over 500 people have done the same.¹³² China sent their first taikonaut to space in 2003.¹³³ Since 1972, however, no humans have traveled beyond LEO.¹³⁴

States primarily benefit from the use of space in the form of information.¹³⁵ Klein argues that information, defined as “facts, data, or instructions in any medium or form, along with their transfer and the meaning assigned to them”¹³⁶, is gathered or broadcasted in space by using space capabilities based in space or on Earth. Information can then be used for a wide range of military, commercial and scientific purposes. States use satellites to gather and broadcast information in and from space. In simple terms, a satellite is “a body that orbits around another body in space”¹³⁷. For a man-made, artificial satellite to orbit Earth, as opposed to flying off into space or falling back to the

126 Moltz, *Crowded Orbits*, 16.

127 Deganit Paikowsky, *The Power of the Space Club*, (Cambridge: Cambridge University Press, 2017), 9.

128 Moltz, *Crowded Orbits*, 16.

129 Klein, *Space Warfare*, 8.

130 Moltz, *Crowded Orbits*, 26.

131 Johnson-Freese, *Space as a Strategic Asset*, 10

132 “Astronaut Statistics,” *World Spaceflight*, accessed April 27, 2019, <https://www.worldspaceflight.com/bios/stats.php>.

133 Hays, *Space and security*, 93.

134 “Apollo 17 Mission Overview,” *NASA Apollo Lunar Surface Journal*, accessed April 27, 2019, <https://www.hq.nasa.gov/alsj/a17/a17ov.html>.

135 Moltz, *Crowded Orbits*, 13.

136 Klein, *Space Warfare*, 39.

137 “What is a satellite?” *NASA*, accessed May 5, 2019,

https://www.nasa.gov/directorates/heo/scan/communications/outreach/funfacts/txt_satellite.html

ground, its speed must be balanced with the Earth's gravitational pull.¹³⁸ As of November 2018, there were 1.957 satellites in orbit.¹³⁹

Satellites are classified according to their function, like communication satellites, observational satellites and navigation satellites.¹⁴⁰ Communication satellites, often called “comsats”, transmit signals between earth stations and thereby support both military communication and everyday services like mobile phone calls and high-speed internet. Observation satellites provide imagery of the Earth, which can be used for a wide range of purposes, including monitoring crop yields, managing refugee camps and verifying arms control agreements. Navigation satellites, like the Global Positioning System (GPS), guarantee precise navigation and timing (PNT) for planes, ships, cars, nuclear missiles, and much more. A satellite navigation system with global coverage is termed a global navigation satellite system (GNSS). Missile approach warning systems (MAWs) “monitor ICBM launch areas and station areas of submarine-launched ballistic missiles (SLBMs), in addition to tracking space vehicles in low and high orbits”¹⁴¹. The International Space Station (ISS) is the largest satellite in orbit.¹⁴²

Depending on their function, satellites mostly travel in LEO, MEO and GEO (*See Figure 10*), all located within what Dolman calls Earth space.¹⁴³ Located at an altitude of less than 2,000 kilometres, LEO is the closest orbit to the Earth, making it beneficial for observation and communications with mobile devices and easy to reach with a space launch. Roughly half of all satellites, including the ISS, orbit in LEO. Most precision timing and navigation satellites, including the GPS, are located in MEO, at about 10,000 kilometres, where they can cover large areas of the earth and triangulate with each other without losing their connection with receivers on Earth. GEO, located at about 35,800 kilometres, is the highest orbital band in use. At this height, satellites travel at the same speed as the Earth's rotation. They are ideal for detecting missiles and nuclear tests because they “appear to be motionless, allowing them to “stare” continuously at large, continent-sized areas on the ground”¹⁴⁴.

The threat of space weapons have been part of international space politics since the dawn of the Space Age. For clarity, space weapons can be divided in two types: weapons based in space, and weapons based on Earth which can threaten objects in space. The first type has never been

138 McDonald, *Anti-Astropolitik*, 599.

139 “UCS Satellite Database.”

140 Johnson-Freese, *Space as a Strategic Asset*, 35-50.

141 Vishnu Anantamula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” *Astropolitics* 11, no. 3 (2013): 132-155, <https://doi.org/10.1080/14777622.2013.842873>.

142 Moltz, *Crowded Orbits*, 22.

143 McDonald, *Anti-Astropolitik*, 599-600.

144 Moltz, *Crowded Orbits*, 22.

deployed, but the latter type has. The US and the USSR have developed so called counterspace capabilities since the beginning of the Cold War (*See Figure 3 and Figure 4*), but the proliferation of space capabilities have lead an increasing number of states to develop counterspace capabilities of their own.¹⁴⁵ Counterspace capabilities can be both offensive and defensive in nature, but are always supported by information on the space environment or space situational awareness (SSA).¹⁴⁶ Defensive counterspace capabilities help protect one's own space assets from attack, while offensive counterspace capabilities help to prevent the adversary from using their space assets by attacking the satellite, ground system or communications link between them.¹⁴⁷ Furthermore, counterspace capabilities can be ground-based direct-ascent, co-orbital, directed energy, electronic warfare or cyber weapons.¹⁴⁸

The most notable substrata of counterspace capabilities – anti-satellite weapons or ASATs – can destroy satellites in space. The US and the USSR tested nine nuclear weapons in space between 1958 and 1962, but quickly understood, after nuclear ASATs destroyed satellites indiscriminately, that further testing or use would severely limit the uses of space, and so nuclear ASAT tests were banned in the Limited Test Ban Treaty of 1963.¹⁴⁹ The superpowers continued to developed more conventional ASAT weapons in the following decades, and between 1968 and 1982, the USSR developed a co-orbital ASAT which could be launched into space and slowly move towards another satellite and destroy it, before the US developed and tested a direct-ascent ASAT which could be launched from a fighter jet in the 1980s.¹⁵⁰ In 2007, China tested a ground-based direct-ascent ASAT by destroying one of its own satellites.¹⁵¹ The US quickly responded by conducting another test in 2008.¹⁵²

Space capabilities are most often useful to both the military and the civilian sector, both offensive and defensive in nature, and inherently vulnerable. SLVs are dual-use because they are modified ICBMs. While ICBMs are designed to go through space at a very high speed to hit a target on Earth, SLVs “lift a payload to a desired altitude above the Earth and then give that payload enough forward speed to remain in orbit at that altitude”¹⁵³. Furthermore, it is hard to separate between offensive and defensive space weapons. The US space program “Brilliant Pebbles”, which explored the idea of putting hundreds of lasers and thousands of interceptions in space, was an

145 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, xvii-xix

146 Ibid.

147 Ibid.

148 Ibid.

149 Moltz, *Crowded Orbits*, 28-29.

150 Ibid.

151 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 143.

152 Grego, *A History of Antisatellite Programs*.

153 Paikowsky, *The Power of the Space Club*, 9.

obvious space weapons program born from the US Strategic Defence Initiative (SDI) – popularly known as *Star Wars*.¹⁵⁴ The same goes for the US proposal dubbed “Rods from God”, which involved bundles of tungsten rods in space being dropped at “hypersonic velocities to vaporize targets on terrestrial targets”¹⁵⁵. Some space weapon systems are harder to classify. Antiballistic missile (ABM) systems can be used both to protect people from nuclear missiles and destroy satellites in space.¹⁵⁶ Satellites that rely on computers to transmit and manage data can be hacked by computers, jammed or attacked by microsatellites.¹⁵⁷ Last, satellites are hard to defend. Defensive measures, like decoys, extra fuel storage for manoeuvrability, ground-based spares, low-visibility paint, and shutters to keep out damaging laser interference have been proposed, but satellites are shiny objects orbiting in well-known trajectories against a black background.¹⁵⁸

In short, states use space power in the form of SLVs to launch humans and satellites into space to gain valuable information. They have also developed space weapons, like ASATs, to threaten vulnerable satellites and defend them from attack through deterrence. At a fundamental level, most space capabilities are dual-use, offensive-defensive and vulnerable to attack.

1.1.4 Space Regimes

Four core international treaties – the Outer Space Treaty of 1967, the Rescue and Return Agreement of 1968, and the Conventions on Liability of 1973 and Registration of 1976 – regulate space activities.¹⁵⁹ Four additional agreements, the Limited Test Ban Treaty of 1963, the SALT I/Anti-Ballistic Missile Treaty (ABMT) of 1972, International Telecommunications Convention of 1973, and the Convention on the Prohibition of Military or Other Hostile Use of Environmental Modification Techniques of 1980, address or have addressed military-specific concerns.¹⁶⁰ Four UN-related bodies also stand out as some of the most important international space regimes – the Conference on Disarmament (CD) in Geneva, the Committee on the Peaceful Uses of Outer Space (COPUOS) in Vienna, the International Telecommunication Union (ITU) in Geneva and the UN General Assembly under the First Committee – as well as the International Organization for Standardization (ISO) in Geneva.¹⁶¹

154 Moltz, *Crowded Orbits*, 29.

155 Joan Johnson-Freese, *Space warfare in the 21st century* (New York: Routledge, 2017), 65.

156 Johnson-Freese, *Space as a Strategic Asset*, 114.

157 Peter L. Hays, “Spacepower Theory,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 57-79.

158 Moltz, *Crowded Orbits*, 31.

159 Dolman, *Astropolitik*, 77.

160 Ibid.

161 Theresa Hitchens, “Space Security-Relevant International Organizations: UN, ITU, and ISO,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 507-520.

The Outer Space Treaty (OST) commits the signatory states to the peaceful uses of space and bans the placement of weapons of mass destruction in orbit.¹⁶² However, the treaty does not put a ban on the deployment or use of conventional weapons in space. The OST, which was modelled on the Antarctic Treaty of 1957, makes activities in space subject to international law, reaffirms the principles of freedom of use of space and forbids national appropriation, nuclear testing and certain military activity on celestial bodies.¹⁶³ In the three other core treaties, states have accepted responsibility for national space actors through the supervision, authorisation and registration of all non-governmental space activities, given launching states the joint liability for space objects and promised to rescue and return all astronauts. Additionally, the Limited Test Ban Treaty¹⁶⁴ bans nuclear tests in space, while the ABMT – signed by the US and the USSR – limits ABM systems that can be used as offensive ASATs or to dramatically alter the nuclear balance.¹⁶⁵ However, the US effectively withdrew from the ABMT in 2002.¹⁶⁶

The CD, established by the UN General Assembly in 1979 as the only multinational forum for negotiation of arms control and disarmament, has the most impact on traditional security in space, but progress has stagnated due to disagreement between the great space powers.¹⁶⁷ Discussions on the Prevention of an Arms Race in Outer Space (PAROS) began in the CD in 1985, but was disbanded in 1994 and has remained informal ever since.¹⁶⁸ China and Russia have fought for a ban on space-based weapons through PAROS and the 2008 draft treaty PPWT, which the US abstained to vote on when 163 other states adopted it.¹⁶⁹

COPUOS was established by the UNGA in 1959 to promote the peaceful use of space, research, information sharing, international cooperation, education, development and legal issues.¹⁷⁰ Over the last decades, COPUOS has been slowed by intra-agency tensions over space security and other technical issues, but showed progress on a voluntary guideline for avoiding the creation of space debris.¹⁷¹ The ITU administers the Radio Frequency (RF) spectrum and satellite operational

162 “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies.”

163 Sheehan, *The International Politics of Space*, 6.

164 “Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water,” *United States Department of State*, accessed April 27, 2019, <https://www.state.gov/t/isn/4797.htm#treaty>.

165 “Anti-Ballistic Missile Treaty,” *Federation of American Scientists*, accessed April 27, 2019, <https://fas.org/nuke/control/abmt/>.

166 “U.S. Withdrawal From the ABM Treaty: President Bush’s Remarks and U.S. Diplomatic Notes,” *Arms Control Association*, accessed April 27, 2019, https://www.armscontrol.org/act/2002_01-02/docjanfeb02.

167 Hitchens, “Space Security-Relevant International Organizations,” 508.

168 Ibid, 509.

169 “Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects,” *Ministry of Foreign Affairs of the People’s Republic of China*, accessed April 27, 2019, http://www.fmprc.gov.cn/mfa_eng/wjb_663304/zjzg_663340/jks_665232/kjfywj_665252/t1165762.shtml.

170 Hitchens, “Space Security-Relevant International Organizations,” 511-512.

171 Ibid.

positions on orbit – known as “slots”.¹⁷² Both the RF spectrum and slots legally considered to be a limited natural resources that all states have equal rights to use. States can use the spectrum freely within their own borders, but satellite communication signals cross borders. States must therefore apply to the ITU for the rights to use frequency bands and slots. Military satellites are exempted, but most militaries still comply with ITU rules. The First Committee has mainly been preoccupied with so called Transparency and Confidence Building Measures (TCBMs), but face many of the same problems as the CD and COPUOS. The ISO is a non-governmental agency which produces technical and industrial practice standards.¹⁷³

In short, the international space regime, which includes a number of treaties and institutions, many of them associated with the UN, is designed to regulate how space actors, primarily states, can use space power and interact in space. However, the regime is to some degree outdated and troubled by ineffective cooperation.

1.2 Literature Review: IR Theory on International Space Politics

What has already been written on international space politics? The second subchapter of Chapter I, divided in four sections, is a survey of the existing IR literature on space war. At first glance, the literature seems to be in its infancy. Surprisingly few scholars have explicitly applied existing IR paradigms and theories to problems related to space. The space security field is dominated by military analysts and policy experts, most of whom unconsciously utilize and mix theoretical concepts from IR without ever explicitly accounting for their theoretical framework.

Several Cold War historians, most notably McDougall¹⁷⁴, have pointed IR scholars in the right direction by uncovering some of the core dynamics of international space politics. Moltz¹⁷⁵ have distinguished between different schools of thought on space security, often overlapping the realist, liberalist and constructivist paradigms of IR, to categorize existing views both inside and outside academics. Moltz argues that there are four main schools: space nationalism, global institutionalism, technological determinism and social interaction.¹⁷⁶ Excluding technological determinism¹⁷⁷, the three remaining schools roughly correspond to realism, liberalism and

172 Ibid, 515-517.

173 Ibid, 517-518.

174 McDougall, *The Heavens and the Earth*.

175 James C. Moltz, *The Politics of Space Security: Strategic Restraint and the Pursuit of National Interests* (Stanford: Stanford University Press, 2011).

176 Ibid.

177 Technological determinism holds that state competition in space is inevitable due to technological progress.

constructivism. Moltz considers space nationalism and global institutionalism, much like realism and liberalism in IR, to be the opposing poles and the largest schools.¹⁷⁸ In other words, familiar debates from IR seem to be implicitly represented in the existing literature on the space security. Techno-nationalist theory is also worth mentioning, as it has helped IR scholars explain technologically driven activities like international space politics while keeping the nation state as the key unit of analysis.¹⁷⁹¹⁸⁰

The second subchapter is divided in four sections. The first section presents a brief summary of studies discussing space security in general terms through the theoretical lenses provided by the various paradigms of IR. The three following sections are dedicated to space security studies using realism, liberalism and constructivism. In short, all the dominant IR theories seem useful in the study of international space politics, but realism seems to explain the core dynamics, especially in the First Space Age.

1.2.1 Space Studies Discussing IR Paradigms

Sheehan¹⁸¹ and Pfaltzgraff¹⁸² have both explored international space politics by using the three dominant paradigms in IR. Galloway¹⁸³, Hansel¹⁸⁴, Słomczyńska Irma¹⁸⁵ Weeks¹⁸⁶¹⁸⁷, Mutschler¹⁸⁸, Kahn and Kahn¹⁸⁹, and Petroni and Bianchi¹⁹⁰ have used several paradigms in their analysis.

Sheehan concludes that the dominant paradigms of international relations continue to clash on international space politics.¹⁹¹ The history of the Space Age, especially the space race during the

178 Ibid, 23.

179 David E. H. Edgerton, "The Contradictions of Techno-Nationalism and Techno-Globalism: A Historical Perspective," *New Global Studies* 1, No. 1 (2007): 1-32, <https://doi.org/10.2202/1940-0004.1013>.

180 As a contrasting concept, techno-globalism holds that technology is turning the world into a "global village" in which the nation state is a temporary vehicle through which the forces of techno-globalism operate.

181 Sheehan, *The International Politics of Space*.

182 Robert L. Pfaltzgraff, "International Relations Theory and Spacepower," in *Toward a Theory of Space Power: Selected Essays*, ed. Charles D. Lutes and Peter L. Hays with Vincent A. Manzo, Lisa M. Yambrik, and M. Elaine Bunn (Washington, D.C.: Institute for National Strategic Studies - National Defense University, 2011).

183 Jonathan F. Galloway, "An International Relations Perspective on the Consequences of SETI," *Space Policy* 12, no. 2 (1996): 135-137, [https://doi.org/10.1016/0265-9646\(96\)00005-7](https://doi.org/10.1016/0265-9646(96)00005-7).

184 Mischa Hansel, "The USA and Arms Control in Space: An IR Analysis," *Space Policy* 26, no. 2 (2010): 91-98. doi: 10.1016/j.spacepol.2010.02.011.

185 Irma Słomczyńska, "Space Power Theory: A Tailor-made Approach or a New Theoretical Challenge to IR?" *Ad Americam* 14 (2013): 139-148.

186 Edythe E. Weeks, *Politics of Space Law in a Post Cold War Era: Understanding Regime Change* (Flagstaff: Northern Arizona University, 2006), <http://dx.doi.org/10.2139/ssrn.2458127>.

187 Edythe E. Weeks, *Outer Space Development, International Relations and Space Law: A Method for Elucidating Seeds* (Cambridge: Cambridge Scholars Publishing, 2012).

188 Mutschler, "Security Cooperation in Space and International Relations Theory."

189 Zulfqar Kahn and Ahmad Kahn, "Chinese Capabilities as a Global Space Power," *Astropolitics* 13, no. 2-3 (2015): 185-204, <https://doi.org/10.1080/14777622.2015.1084168>.

190 Giorgio Petroni and Davide G. Bianchi, "New Patterns of Space Policy in the Post-Cold War World," *Space Policy* 37, no. 1 (2016): 12-19, <https://doi.org/10.1016/j.spacepol.2016.10.002>.

191 Sheehan, *The International Politics of Space*.

Cold War, seems to support both classical realist and neorealist international relations theory. Classical realism explains how the the USSR and the US ventured into space to acquire military capabilities, like nuclear missiles and reconnoissance satellites, to gain unquantifiable degrees of prestige and demonstrate relative power capabilities without resorting to nuclear warfare. Neorealism explains the convergence in goals between major powers' space programs as a case of functionally similar states emulating each other to survive in the anarchic system. The theory of techno-nationalism, which holds that "the economic and political power associated with access to the most advanced technology has made it the crucial determinant of international power and status"¹⁹², helps realist theory in explaining international space politics. Liberalism is useful for studying international space law, international space institutions and international space cooperation. Constructivism, especially post-structuralism, helps us understand why certain ideas about space are seen as valid and others not.

Pfaltzgraff has used IR theory to explore both near-term space issues, like how space affects international politics on Earth, and longer term issues like future space colonies.¹⁹³ Near-term space issues are the most relevant for this thesis. Pfaltzgraff argues that realism can explain space politics as a struggle for power and explain why technologically advanced states view the ability to defend or destroy space assets as a national security concern, why they want a large private space sector, and why developing countries seek to slow or stop more developed states from becoming too powerful in space. Geopolitical theory can explain how technology has made space more important in international politics. Neoliberalism can explain the effects of formal and informal space-related regimes, especially among democracies, as well as increasing interdependence in space and spillover effects from the space sector to other sectors. Constructivism is fertile because it allows us to analyse the existing rules of behaviour in space and show that we can make space whatever we want it to be. Since no IR theory can single-handedly explain, describe or prescribe politics on Earth, Pfaltzgraff concludes that we must be careful when drawing on IR theory to theorize about space.

Galloway has analysed the consequences of the search for extraterrestrial intelligence (SETI) from the perspectives of realism and idealism, arguing that realism will portray first contact with extraterrestrials as conflictual, while idealism suggests that we could bond over our similarities and even help each other.¹⁹⁴

Hansel has assessed the advantages and disadvantages of various space arms control

¹⁹² Ibid, 7.

¹⁹³ Pfaltzgraff, "International Relations Theory and Spacepower."

¹⁹⁴ Galloway, "An international relations perspective on the consequences of SETI."

proposals from the perspectives of interdependence theory, neoliberal institutionalism and neorealism.¹⁹⁵ Interdependence theory suggests that an international regime against space-debris producing activities that can hurt the space environment irreversibly and indiscriminately, like the use of kinetic energy in space, coupled with additional codes of conduct and guidelines would produce the most absolute gains. Neoliberal institutionalism suggests a similar solution: an international treaty on the use of kinetic energy to lower the incentives of cheating. Neorealism suggests that the major powers have opposing interests: the US would benefit from an agreement against collision and destruction of spacecraft, because of its reliance on space assets, while Russia and China would benefit more from a ban against space-based weapons, which are useful for missile defence, because they threaten their strategic nuclear weapons.

In her Gramscian analyses of the role of private-sector business and free market ideology in the international space regime, Weeks first considered the value of the three dominant IR paradigms.¹⁹⁶¹⁹⁷ She concludes that realism explains the role of the US and the USSR in the early development of the regime. Neoliberalism explains the later inclusion of economic, social and environmental issues and the growing importance of non-state actors. Constructivism explains that beliefs about space are shaped by discourse production.

Słomczyńska has analysed US space power theories with reference to IR theories.¹⁹⁸ Based on the assumption that space systems and space exploitation are becoming an increasingly important factor for states and non-state actors, Słomczyńska reviews existing literature and concludes that no comprehensive space power theory has been formulated or challenged IR.

Mutschler has analysed security cooperation in space using neorealism, neoinstitutionalism and constructivism/liberalism.¹⁹⁹ Neorealism points out that any space security cooperation must produce balanced gains to stand a chance of success. For neoinstitutionalism, interdependence in space provides strong incentives for cooperation. Ultimately, constructivism/liberalism suggests that states must learn to overcome their belief in unilateral action in space.

Kahn and Kahn has explored Chinese space capabilities through the IR paradigms of realism, liberalism and constructivism – as well as technological determinism.²⁰⁰ They conclude that China's space program is "motivated by space nationalism, technological determinism, and security dilemma imperatives" and that China, on the whole, "has proved that it is not only a regional space

195 Hansel, "The USA and arms control in space."

196 Weeks, *Politics of Space Law in a Post Cold War Era*.

197 Weeks, *Outer Space Development, International Relations and Space Law*.

198 Słomczyńska, "Space Power Theory."

199 Mutschler, "Security Cooperation in Space and International Relations Theory."

200 Kahn and Kahn, "Chinese Capabilities as a Global Space Power."

power, but also a prospective global space power”.²⁰¹

Petroni and Bianchi have analysed space policy in the post-Cold War world from the perspectives of realism and liberalism.²⁰² They conclude that realism best explains the space policy of the bipolar Cold War, while liberalism better explains the commercially driven space policy of the multipolar post-Cold War world. However, economic leadership in space remains the basis for military supremacy in the multipolar international system.

In short, most of the scholars seem to agree that the three dominant IR paradigms all have value in the study of space security. The same paradigms continue to clash against each other on issues related to space. Realism can explain international space politics as a struggle for power over space assets that have become a national security concern. Neorealism can explain international hostilities and conflict in space as well as convergence in goals due to insecurity. Liberalism can explain international space regimes, space law, space institutions, space cooperation and spillover effects in the space sector. Constructivism can uncover rules of behaviour and help us understand why certain ideas are valid and others not.

1.2.2 Space Studies Using Realism

Colaresi and Rennstich²⁰³, Johnson-Freese and Erickson²⁰⁴, Bolton²⁰⁵, Burzykowska²⁰⁶, López²⁰⁷, and Harding²⁰⁸ have explicitly applied realist theories to specific space-related problems.

Colaresi and Rennstich have applied a theory of two-level rivalry dynamics in a in-depth quantitative study on the US-Soviet space race.²⁰⁹ Their study findings “confirm a two-level logic for rivalry maintenance, whereby increased competition from an enemy is inflated by domestic politics and inflames further competition in the future”²¹⁰. According to the authors, evidence further suggests that US presidents have used space launches for political boosts when approval ratings are low, and that superpower conflict in space has diverted other types of conflict.

201 Ibid.

202 Petroni and Bianchi, “New Patterns of Space Policy in the Post-Cold War World.”

203 Michael P. Colaresi and Joachim K. Rennstich. *Lost in Space: A Time-Series Analysis of the U.S.-Soviet Space Race* (Montreal: International Studies Association, 2004).

204 Joan Johnson-Freese and Andrew S. Erickson, “The Emerging China–EU Space Partnership: A Geotechnological Balancer,” *Space Policy* 22, no. 1 (2006): 12-22, <https://doi.org/10.1016/j.spacepol.2005.11.001>.

205 Iain R. B. Bolton, “Neo-realism and the Galileo and GPS negotiations,” in *Securing Outer Space*, ed. Natalie Bormann and Michael Sheehan, (Abingdon: Routledge, 2009), 186-204.

206 Burzykowska, “Smaller states and the new balance of power in space.”

207 Laura D. López, “Predicting an Arms Race in Space: Problematic Assumptions,” *Astropolitics* 10, no. 1 (2012): 49-67, <http://dx.doi.org/10.1080/14777622.2012.647391>.

208 Harding, *Space Policy in Developing Countries*.

209 Colaresi and Rennstich, “Lost in Space.”

210 Ibid, 2.

Johnson-Freese and Erickson have used a techno-nationalist balance of power theory to analyse the emerging China-EU partnership in space.²¹¹ They conclude that “all potential great powers, believing that they must depend only on themselves, engage in techno-nationalist realpolitik”²¹² in space because dual-use space technology is essential for economic development and valuable to both the civilian and the military sector. Thus, techno-nationalism, which informs Chinese, US and Russian perceptions, lifts all space activities to the strategic, state level. More importantly, it can help explain geotechnological posturing as a high-technology form of balancing behaviour.

Similarly, Bolton has used neorealism coupled with elements of techno-nationalism to show that the Sino-European cooperation on the Galileo project is an attempted effort to balance against the US.²¹³ In other words, Bolton considers investments in advanced civilian dual-use technology to be balancing behaviour.

Burzykowska has analysed the role of smaller states in the new balance of power in space, concluding that the increase in new spacefaring nations has created a multipolar security environment which has influenced “the current state of affairs related to the militarization and weaponization of outer space, the security postures of the already established space powers and the global balance of power in general”²¹⁴.

Harding has used realist theory in his recent monograph on space policy in developing countries.²¹⁵ He concludes that developing states, just like already developed ones, now view space activities as “the ultimate measure of national power, international prestige, and demonstrated national potential”²¹⁶.

López has used structural realism to analyse the assumptions behind the argument that the US placement of weapons in space would inevitably lead to an arms race in space.²¹⁷ Drawing on other notable scholars of international space politics, like Dolman and Moltz, López ultimately concludes that such an outcome is only probable and that the continued use of the argument weakens the overall argument of anti-space weapons proponents.²¹⁸

In short, powerful states engage in self-help behaviour and techno-nationalist realpolitik in

211 Johnson-Freese and Erickson, “The emerging China–EU space partnership.”

212 Ibid, 15.

213 Bolton, “Neo-realism and the Galileo and GPS negotiations.”

214 Burzykowska, “Smaller states and the new balance of power in space,” 191.

215 Harding, *Space Policy in Developing Countries*.

216 Ibid, 4.

217 López, “Predicting an Arms Race in Space: Problematic Assumptions”.

218 Ibid.

space. International space politics is driven by rivalry in which innovations in high-technology and alliance-building works as a form of balancing behaviour. Moreover, international conflict in space can possibly divert conflict on Earth. As most states have discovered the value from space capabilities, the distribution of space power in the international system has gone from being bipolar to more multipolar.

1.2.3 Space Studies Using Liberalism

This section serves as a state of the art of literature applying liberalism to problems related to space security. Sadeh²¹⁹, Stuart²²⁰²²¹ and Luzin²²² have explicitly applied liberalist theory to specific space-related problems.

Sadeh has used theories of bureaucratic politics to analyse the creation of space policy as foreign policy.²²³ He concludes that “[s]pace policy-making, whether in the civil, commercial or military sector, involves a multitude of advocacy coalitions, government actors and agencies and commercial corporations competing over resources and objectives and control of space programmes and projects”²²⁴.

Stuart has used regime theory to analyse the international space regime.²²⁵²²⁶ She concludes that regime theory does provide tools for “understanding those instances in which actors pursue coordination in areas of complex governance, such as the realm of outer space”²²⁷ and for “explaining the negotiations and preference formations that lead to cooperate regimes”²²⁸. However, Stuart admits that regime theory is not a “grand theory capable of providing generalizable conclusions”²²⁹ and that it might overlook social and constructivist forces because of its rationalist approach.

Luzin has used soft power theory to analyse space as Russia’s soft-power tool and concludes that Russia’s historical and continued success in space gives the country many opportunities to improve its international standing in several indirect ways – for example in shaping the international

219 Eligar Sadeh, ed., *The Politics of Space: A Survey* (Abingdon: Routledge, 2011).

220 Jill Stuart, “Unbundling Sovereignty, Territory, and the State in Outer Space: Two Approaches,” in *Securing Outer Space*, ed. Natalie Bormann and Michael Sheehan (Abingdon: Routledge, 2009), 8-23.

221 Jill Stuart, “Regime Theory and the Study of Outer Space Politics,” *E-International Relations*, September 10, 2013. <http://www.e-ir.info/2013/09/10/regime-theory-and-the-study-of-outer-space-politics/>

222 Pavel Luzin, “Outer Space as Russia’s Soft-Power Tool,” *Security Index: A Russian Journal on International Security* 19, no. 1 (2013): 25-29, <https://doi.org/10.1080/19934270.2013.757117>.

223 Sadeh, *The Politics of Space: A Survey*.

224 Ibid, 24.

225 Stuart, “Unbundling sovereignty, territory, and the state in outer space.”

226 Stuart, “Regime Theory and the Study of Outer Space Politics.”

227 Ibid.

228 Stuart, “Unbundling sovereignty, territory, and the state in outer space,” 20.

229 Ibid.

space agenda.²³⁰ However, Russia needs a more clearly articulated space strategy to live up to its full soft power potential.

In short, liberalism can explain commercial competition, complex governance, negotiations, preference formations, advocacy coalitions and soft power in international space politics.

1.2.4 Space Studies Using Constructivism

This section serves as a state of the art of literature applying constructivism to problems related to space security. Litfin²³¹, Mueller²³², Peterson²³³, Peoples^{234,235,236}, Bormann and Sheehan²³⁷, and Moltz²³⁸ have studied space security-related problems with a constructivist approach.

Litfin has analysed the influence of space technology on epistemic sovereignty, concluding that earth-sensing satellites has made it harder for states to control information about what happens on their own territory.²³⁹

Mueller has attempted to depolarize a space weaponisation debate that is “typically cast in simplistic, unidimensional terms, while many participants caricature their opponents as naive pacifists or rabid warmongers”²⁴⁰, and debunk the inevitability thesis.

Peterson has traced the the use of analogies as mental constructs in the development of space law.²⁴¹

Peoples has written several articles about the discourse on space security, for example on overcoming the inevitability thesis²⁴², the securitisation of space²⁴³ and the Japanese discourse on space security²⁴⁴

230 Luzin, “Outer Space as Russia's Soft-Power Tool.”

231 Karen T. Litfin, “The Status of the Statistical State: Satellites and the Diffusion of Epistemic Sovereignty,” *Global Society* 13, no. 1 (1999): 95-116, <https://doi.org/10.1080/13600829908443180>.

232 Karl P. Mueller, “Totem and Taboo: Depolarizing the Space Weaponization Debate,” *Astropolitics* 1, no. 1 (2003): 4-28, <https://doi.org/10.1080/1477-760391832499>.

233 M. J. Peterson, “The Use of Analogies in Developing Outer Space Law,” *International Organization* 51, no. 2 (1997): 245-274, <https://doi.org/10.1162/002081897550357>.

234 Columba Peoples, “A Normal Space Power? Understanding “Security” in Japan's Space Policy Discourse,” *Space Policy* 29, no. 2, (2013): 135-143, <https://doi.org/10.1016/j.spacepol.2013.03.001>.

235 Columba Peoples, “The Growing ‘Securitization’ of Outer Space,” *Space Policy* 26, no. 4 (2010): 205-208, <https://doi.org/10.1016/j.spacepol.2010.08.004>.

236 Peoples, *Assuming the Inevitable?*

237 Natalie Bormann and Michael Sheehan, eds., *Securing Outer Space* (Abingdon: Routledge, 2009).

238 Moltz, *The Politics of Space Security*.

239 Litfin, “The Status of the Statistical State: Satellites and the Diffusion of Epistemic Sovereignty.”

240 Mueller, “Totem and Taboo.”

241 Peterson, “The Use of Analogies in Developing Outer Space Law.”

242 Peoples, “Assuming the Inevitable?”

243 Peoples, “The Growing ‘Securitization’ of Outer Space.”

244 Peoples, “A Normal Space Power? Understanding “Security” in Japan's Space Policy Discourse.”

Bormann and Sheehan have co-edited the book *Securing Outer Space*, in which most of the chapters are dedicated to constructivist and critical theory.²⁴⁵ The book includes interesting contributions from Stuart²⁴⁶, Peoples²⁴⁷, and Griffin²⁴⁸, among others. Stuart contrasts her regime theory research, outlined above, with a theory of cosmopolitan sovereignty. Peoples draws on Marcuse to critically analyse the relationship between space and strategy. Griffin uses gender theory to deconstruct the space discourse in the US. Most of the book's chapters deal with “questions of conceptualization and the way that space is socially constructed to have particular meanings”²⁴⁹.

Moltz has analysed space security using a framework of environmental learning and argues that the growing commercial space industry can play an important role as an epistemic community fighting for the sustainable use of space.²⁵⁰

In short, constructivism is useful in the analysis of discourse on space and when navigating questions of sovereignty, inevitability, sustainability and gender in international space politics.

1.3 The First Neorealist Hypothesis: Space Security through Balance of Space Power

The first neorealist hypothesis holds that *a bipolar balance of space power in the international system* has decreased the risk of space war. The third subchapter of Chapter I explores the theoretical underpinnings of the hypothesis to extrapolate useful concepts for the theoretical framework on international space politics.

The subchapter is divided in two sections: the first on defensive neorealism (DN) according to Waltz, and the second on offensive neorealism (ON) according to Mearsheimer. Both neorealist balance-of-power theories suggest that anarchy is the permissive cause of space war and that the distribution of space power is the key variable. They also suggest that an international system with a rough balance between two great space powers, a bipolar system, is the most stable and the least prone for space war.²⁵¹ In *A Theory of International Politics*, Waltz argues that the anarchical structure of the international system constrains states to maximise their security through self-help

245 Bormann and Sheehan, *Securing Outer Space*.

246 Stuart, “Unbundling sovereignty, territory, and the state in outer space.”

247 Columba Peoples, “Haunted Dreams: Critical Theory, Technology and the Militarization of Space,” in *Securing Outer Space*, ed. Natalie Bormann and Michael Sheehan (Abingdon: Routledge, 2009), 91-107.

248 Penny Griffin, “The Space Between Us: The Gendered Politics of Outer Space,” in *Securing Outer Space*, ed. Natalie Bormann and Michael Sheehan (Abingdon: Routledge, 2009), 59-75.

249 Bormann and Sheehan, *Securing Outer Space*, 6.

250 Moltz, *The Politics of Space Security*, 297-304.

251 Nye and Welch, *Understanding Global Conflict and Cooperation*, 55.

behaviour and power politics.²⁵² In *The Tragedy of Great Power Politics*, Mearsheimer has challenged Waltz on the incentives for expansion under anarchy.²⁵³ Building his theory on assumptions similar to Waltz's, Mearsheimer agrees that bipolar systems are the least war prone, but argues that anarchy forces states to maximise power instead of security.²⁵⁴ Consequently, Mearsheimer's theory has been labelled offensive while Waltz's theory has been labelled defensive.

1.3.1 Defensive Neorealism (DN) on Space War

The essential elements of Waltz's DN, a systemic balance-of-power theory, is the anarchic structure of the international political system, the functional equality of its constituent state units and the distribution of material capabilities among those state units.²⁵⁵ Waltz considers the international political system to be decentralized and anarchic.²⁵⁶ The system, like economic markets, is formed through the coexistence of self-regarding units and "[w]hether those units live, prosper, or die depends on their own efforts"²⁵⁷. Under anarchy, security and survival are the highest ends.²⁵⁸ Since units in an anarchic system have to rely on themselves to maintain security and achieve objectives, self-help is the principle of action. Thus, the international system is a self-help system.

Waltz considers states to be the only units of the international system because non-state actors show no sign of rivalling or surpassing the great powers.²⁵⁹ The units are considered to be functionally undifferentiated because they are all autonomous, political units facing the same tasks, but are distinguished by their greater or lesser possession of material capabilities for performing those same tasks.²⁶⁰ In other words, states have different levels of power – military, economic and other capabilities – which they use to provide for their own security. They are ranked according to the sum of their population, territory, resources, economy, military competence and political stability.²⁶¹ Because authority in the anarchical international system is expressed through capabilities, states compete for power to stay secure.²⁶²

The distribution of capabilities in the system strongly influences state behaviour and the outcomes of state interaction.²⁶³ Balancing is a type of behaviour and war is a type of outcome.

252 Waltz, *Theory of International Politics*.

253 Mearsheimer, *The Tragedy of Great Power Politics*.

254 Ibid, 45.

255 Waltz, *Theory of International Politics*, 99.

256 Ibid, 89.

257 Ibid, 90.

258 Ibid, 126.

259 Ibid, 95.

260 Ibid, 96-97.

261 Ibid, 131.

262 Ibid, 89.

263 Ibid, 97.

States can balance by converting wealth into military power, forming counterbalancing alliances, passing the buck to another state, entering into postwar peace settlements, and by emulating other states.²⁶⁴ Since states seek security before all other objectives, states tend to balance against the most powerful state by joining the weaker side of two coalitions.²⁶⁵ They do this to avoid domination by the strongest state. Balancing is the result of uncoordinated action between self-regarding states, whether or not those states consciously aim to establish and maintain such a balance.²⁶⁶

Balancing is done differently in multipolar systems, containing three or more great powers, than in bipolar systems, containing only two great powers.²⁶⁷ In opposition to what he calls “conventional wisdom”, which preaches that multipolar systems are the most stable, Waltz argues that bipolar systems are the most stable because balancing is more effective when there are only two great powers.²⁶⁸ Waltz writes: “In a bipolar world, two states check and balance each other. In a unipolar world, checks on the behaviour of the one great power drop drastically.”²⁶⁹ Unipolar systems, in which there is only one great power, most often disintegrates when other states balance against it or challenge the hegemonic state. That is why unipolar systems quickly become bipolar or multipolar. Wohlforth has challenged this view, arguing that the US is so preponderant in terms of economic, military, technological and geopolitical power that the current unipolarity is both durable, stable and prone to peace.²⁷⁰ Jackson and Sørensen sum up Walt’s bipolarity argument in three points. First, the possibilities of great-power war is reduced, because there are fewer great-power conflicts. Second, less great powers involved means easier deterrence. Third, the chances of miscalculation are lower.²⁷¹ In short: “the two rival superpowers can keep their eyes steadily fixed on each other without the distraction and confusion that would occur if there were a large number of great powers”²⁷², but they might also broaden the range of factors included in competition, since “anything that happens anywhere is potentially of concern”²⁷³.

In short, DN suggests that the decentralized and anarchic nature of space forces self-regarding states to seek space security through self-help behaviour and space power politics. These states face the same tasks in space, but are differentiated by their amount of space power. Thus, states probably compete for space power. The distribution of space power among states should

264 Ibid, 102-128.

265 Ibid, 127.

266 Ibid, 119.

267 Ibid, 161-164.

268 Ibid.

269 Waltz, *Neorealism: Confusions and Criticisms*, 4.

270 Wohlforth, *Realism and the End of the Cold War*, 7.

271 Jackson and Sørensen, *Introduction to International Relations*, 77.

272 Ibid, 78.

273 Waltz, *Theory of International Politics*, 171.

affect the outcomes of international space politics – like space war and space security. Consequently, the great space powers should matter the most. Furthermore, DN suggests that states engage in balancing, buck-passing, post-war settlements and emulation in space, and that they can turn their wealth into space power. States can be expected to balance against the dominant space power. Waltz's argument on the safety and stability of bipolarity should hold up in space, as states can “keep their eyes steadily fixed on each other” there as well as on Earth.

1.3.2 Offensive Neorealism (ON) on Space War

Mearsheimer's ON is based on five assumptions about the international political system.²⁷⁴ First, he assumes that great powers are the main actors in international politics, because they have the largest impact, and that the international system lacks central authority. The state system is therefore labelled anarchic. Second, all states are assumed to have some offensive military capability which can inflict damage on other states. Third, states cannot be sure about the intentions of other states. Fourth, the main goal of states is survival. Fifth, states are assumed to be rational actors.

Where Waltz argues that excessive amounts of power can make a state less secure because other states tend to balance against it, Mearsheimer argues that the structure of the international system always gives states incentives to pursue hegemony.²⁷⁵ Since the international system always provides incentives for further expansion, the world is left with recurring great-power competition. Glaser and Kaufmann has argued that the balance between offensive and defensive weapon technology can limit and boost cooperation in the international system.²⁷⁶²⁷⁷ Mearsheimer, however, does not accept their arguments. In his opinion, becoming the dominant power is the best way to assure survival.²⁷⁸ Great powers will defend the balance of power, through balancing and buck-passing, when it favours them and undermine it, through war and blackmail, when it does not.²⁷⁹ Unless a state reaches the goal of world hegemony, so that it can dominate all the other states in the system, it will not be satisfied with the status quo – it always wants more power.²⁸⁰ However, the large bodies of water on Earth makes the goal of achieving global hegemony incredibly hard and highly unlikely. The best-case scenario is to achieve regional hegemony while preventing other states from achieving a similar position in another region.²⁸¹

274 Mearsheimer, *The Tragedy of Great Power Politics*, 5.

275 Ibid, 12.

276 Charles L. Glaser, “Realists as Optimists: Cooperation as Self-Help,” *International Security* 19, no. 3 (1994): 50-90, doi: 10.2307/2539079.

277 Charles L. Glaser and Chaim Kaufmann, “What is the Offense-Defense Balance and How Can We Measure It?” *International Security* 22, no. 4 (1998): 44-82, <https://doi.org/10.1162/isec.22.4.44>.

278 Mearsheimer, *The Tragedy of Great Power Politics*, xi.

279 Ibid, 3.

280 Ibid, 40

281 Ibid, 41

Mearsheimer defines power as the “particular material capabilities that a state possesses”²⁸² or “tangible assets”²⁸³, but makes a distinction between latent power and military power. Military power, judged by the army and its supporting air force and navy, is the most important form of power because “a state’s effective power is ultimately a function of its military forces and how they compare with the military of rival states”²⁸⁴. However, states need societal resources to develop military power. Resources like money, technology and people, based on wealth and population size, are therefore gathered under the umbrella term latent power.²⁸⁵ Big armies can only be raised in states with large populations. Similarly, powerful armies cannot be equipped, trained or modernized without money and technology.²⁸⁶ Interestingly, Mearsheimer considers space technology to be an example of latent power.²⁸⁷

In short, ON suggests that anarchy in space forces great space powers, with some offensive space capabilities at their disposal, to maximize their space power and aim for space hegemony to assure their survival. However, the geography of space, like the geography of Earth, should make this a difficult task. Thus, ON might imply that states seek space hegemony or at least aim to keep their rivals from achieving the same goal. Furthermore, states can be expected to engage in balancing, buck-passing, blackmail and war to maintain a beneficial balance of space power. Military space power should, according to ON, be the most important, but latent space power, in the form of money, technology and man power, is an essential component.

1.4 The Second Neorealist Hypothesis: Space Security through Preponderance of Space Power

The second neorealist hypothesis holds that *a preponderance of space power in the international system has decreased the risk of space war*. The fourth subchapter of Chapter I explores the theoretical underpinnings of the hypothesis to extrapolate useful concepts for the theoretical framework on international space politics.

The fourth subchapter is divided in two sections: the first on power transition theory (PTT) according to Organski²⁸⁸, and the second hegemonic stability theory (HST) according to Gilpin.

282 Ibid, 55.

283 Ibid.

284 Ibid, 55-56.

285 Ibid, 55.

286 Ibid, 61

287 Ibid, 56.

288 Organski, *World Politics*.

Both suggest that space wars are most likely to occur when there is an approaching balance of power between the dominant nation and a major challenger. In *World Politics*, Organski argues that states go through various stages of industrialisation and that war is likely to occur when a dissatisfied state experiences so much internal growth that it achieves power parity with the dominant state in the hierarchically organised international system. In *War and Change in World Politics*, Gilpin ascribes the reoccurrence of war to power parity caused by differential growth rates among states, but he uses states' expected marginal costs and benefits – the expected net gain – related to systemic change to explain when war is most likely to break out. PTT and HST part ways with DN and ON in their rejection of balance of power as a source for peace and stability, their description of the international political system, and their inclusion of dynamic factors. However, both theories are included in the paradigm by Taliaferro because of their systemic approaches and focus on powerful state actors.²⁸⁹

1.4.1 Power Transition Theory (PTT) on Space War

Organski, who founded PTT, was the first scholar to present a thorough critique of balance-of-power theory: he thinks it “distorts grossly the meaning of events, that it is an alien plant plucked from another discipline and forcibly transplanted in the field of international power relations. What is more, the theory is not even consistent with itself”²⁹⁰. Organski rejects the idea that a balance of power brings peace and stability to the international system. On the contrary, he argues, balances of power have caused the most destructive wars in modern history.²⁹¹ Similarly, Lemke, another prominent power transition scholar, rejects that “exclusive logical claim behind bipolarity as a stabilizing effect”²⁹². Shifts in power caused by industrialization cause instability.²⁹³ Three stages of industrial growth political modernisation boosts the major determinants of a state power, which are population size, political efficiency and economic development.²⁹⁴ States first experience an initial stage (1) of potential power marked by slow or no growth, followed by a second stage (2) of rapid transitional growth, and a third stage (3) of power maturation in which the state returns to slow growth rates.²⁹⁵

The history of international relations is divided into three distinct time periods (which should not be confused with the three stages of industrialisation).²⁹⁶ In the first period, which lies in

289 Taliaferro, “Security Seeking under Anarchy: Defensive Realism Revisited.”

290 Organski, *World Politics*, 273.

291 Ibid, 299.

292 Douglas Lemke, “The Continuation of History: Power Transition Theory and the End of the Cold War,” *Journal of Peace Research* 34, no. 1 (1997): 23-36, <https://doi.org/10.1177/0022343397034001003>.

293 Organski, *World Politics*, 376.

294 Ibid, 338-340.

295 Lemke, “The Continuation of History: Power Transition Theory and the End of the Cold War,” 28.

296 Organski, *World Politics*, 345.

the past, no state had yet industrialized – all states were in stage 1 of industrialization. Power gaps were small and not based on industrial strength. In the second period, which is the current period of industrial revolution, some states have and some have not yet industrialized. Since states are passing through different stages of industrialization, the power gaps between them are huge, but states entering stage 2 are starting catching up with states in stage 3. In the third period, which is still a prospect of the future, all states will have entered stage 3 and begin to resemble each other. Because states do not go through the process of industrialisation together, the relative distribution of power in the international system is always changing.²⁹⁷ And because the constant change in power relations brings instability to international politics, internal growth rates are considered to affect international politics more than military strength and alliances politics.²⁹⁸

Organski acknowledges the lack of a central government in the international system, but views the structure of the international system as more orderly and hierarchical than the anarchical structure described by Waltz and Mearsheimer. International politics is organised in a clear hierarchy separating powerful and weak states, with one dominant state above all the others. The dominant state in the system always seeks to establish an international order that benefits itself and some other states in the form of wealth, security and prestige.²⁹⁹ The international order determines how goods are distributed and how states should behave in the international system. Some states will always be satisfied with the international order and therefore wish to defend it, while others will be dissatisfied and wish to change the international order into a more beneficial one.³⁰⁰

States normally compete for power, but they do not easily swap one international order for another.³⁰¹ What happens then, when a rising state tries to do just that? PTT predicts that the international system is the most war prone when a dissatisfied state reaches power parity with the dominant state. The combination of power parity, or a balance of power, and dissatisfaction makes war the most likely.³⁰² If a rising state is satisfied, it will not be interested in going to war to change the international order when it reaches power parity. Similarly, a weak state may be dissatisfied, but will not be able to challenge the dominant state. Rising and dissatisfied states, however, have grown strong after the rules were made and benefits allocated – now they want a better deal. Approaching parity with the dominant state, such states suddenly have the power to do something about their dissatisfaction and start demanding changes to the ruling international order or try to establish their

297 Ronald L. Tammen, Ronald, “The Organski Legacy: A Fifty-Year Research Program,” *International Interactions*, 34, no. 4 (2008): 314-332, doi:10.1080/03050620802561769.

298 Organski, *World Politics*, 338.

299 Lemke, “The Continuation of History: Power Transition Theory and the End of the Cold War,” 24.

300 Organski, *World Politics*, 364,

301 Ibid, 354.

302 Ibid, 764.

own. The dominant state, which has established the ruling order – the status quo – to suit its own interests, will resist any attempt to change or replace it.

Tensions between the rising challenger and the dominant state easily lead to a major war. Scholars disagree, though, on whether the dominant or the rising state is likely to attack first.³⁰³ Regardless, the war will determine the new status quo in international politics – until the next unsatisfied challenger comes along.³⁰⁴ On the contrary, the international system is safer as long as the dominant state remains preponderant.³⁰⁵ Some additional factors can make war more or less likely, like the size of the challenger, the speed of the rise of the challenger, the dominant state's flexibility in its policies, the amount of friendship between then dominant nation and the challenger, and the challenger's relationship with the existing international order.³⁰⁶

If uneven growth is such a dangerous phenomena, how do states behave to meet the threat? According to Organski, states have three different strategies, none of which are satisfactory, to choose from.³⁰⁷ First, they can stop the rival's industrialisation by destroying their economy, preventing it from developing rival industries, encouraging export of agricultural products, raw materials or light industries, forcing regime change and going to preventive war. Second, they can engage in half-measures to delay industrialisation, like trade barriers, embargoes and aid refusal, without active interference. Third, they can help the rival industrialize and hope that it remains friendly.

In short, PTT rejects the first neorealist hypothesis and suggests that different rates of internal growth, industrialization and modernization, which boost space power determinants, lead to continuous space power shifts and, once in a while, space power parities that increase the risk of space war. The ruling order in space, a status quo that benefits some and not not others, could be far more hierarchical than what DN and ON suggest. PTT suggests that states are going through three stages of growth in space power. First, a stage of potential space power, followed by a second stage of rapid transitional space power growth, and, last, a third stage (3) of space power maturation. Furthermore, the history of the Space Age could probably be divided into three distinct periods. First, a period in the past with small space power gaps in which no state had yet gone to space. Second, a period with huge space power gaps in which some states have gone to space and some have not. Third, a period in which a all states have gone to space. Ultimately, PTT suggests that the

303 Steven Chan, "Exploring Puzzles In Power-Transition Theory: Implications for Sino-American Relations," *Security Studies* 13, no. 3 (2004): 103-141, <https://doi.org/10.1080/09636410490914077>.

304 Organski, *World Politics*, 339.

305 Lemke, "The Continuation of History: Power Transition Theory and the End of the Cold War," 24.

306 Organski, *World Politics*, 376.

307 Ibid, 347-349

risk of space war is at its highest when a dissatisfied great space power reaches space power parity with the dominant space power because disagreements and tensions over the status quo in space culminate in those moments. The dominant state may try to stop the rising challenger in space by destroying it, weakening it, delaying it or helping it, but none of these strategies are likely to be sufficient.

1.4.2 Hegemonic Stability Theory (HST) on Space War

Gilpin's conceptualisation of HST, which was first developed by Kindleberger, rests on five assumptions about the behaviour of states.³⁰⁸ First, the international system is assumed to be stable unless states see system change profitable. Second, states only attempt to change the international system when there is an expected net gain. Third, states seek system change through expansion until the expected marginal costs outweigh the marginal benefits. Fourth, once there is an equilibrium between the costs and benefits related to system change and expansion, the economic costs of maintaining the status quo tend to rise faster than the economic capacity to support it. Fifth, the resulting disequilibrium, if left unresolved, tend to force a system change reflecting the new distribution of power among states. These assumptions underpin Gilpin's explanation of why and when hegemonic war is the most likely to occur, which is similar to Organski's explanation. In short, hegemonic wars between a hegemony and a challenger – the basic mechanism for political change – is likely to happen when there is a disjuncture between the existing international system and the redistribution of power towards those states that would benefit the most from changing the international system³⁰⁹.

The description of the international system in HST lies somewhere in between the perfect anarchy presented in defensive and offensive neorealism and the power hierarchy presented in PTT. Gilpin argues that “[i]nternational relations continue to be a recurring struggle for wealth and power among independent actors in a state of anarchy”³¹⁰. In spite of economic and technological developments, the fundamental nature of international politics remains the same.³¹¹ Still, the international system is quite orderly.³¹² The dominant powers control how states can interact in the system. Control over the system is a function of three factors. First, the distribution of power among states determines who governs and whose interests are mainly promoted. Second, a hierarchy of prestige, “the everyday currency of international relations”³¹³, also affects the governance of the

308 Gilpin, *War and Change in World Politics*, 10-11.

309 Ibid, 9.

310 Ibid, 7.

311 Ibid.

312 Ibid, 28.

313 Ibid, 29.

system by making lesser powers follow the lead of the dominant state. Prestige is based on material capabilities, but also on reputation: states must be willing and successful at using power, especially military power, to get prestige.³¹⁴ Third, the interaction among states are influenced by a set of rights and rules, ranging from mere understandings to complex treaties.³¹⁵

According to Gilpin, a disequilibrium between the hierarchy of prestige and the actual distribution of power among states is a normal cause of instability and sometimes war. Once in a while, a secondary state's growth and subsequent development of material capabilities can lead to a mismatch between the perceived and actual power relationships in the system. Yet again, there is a rising challenger, but in HST, the variable of satisfaction with the status quo has been exchanged for the expected costs and profits of changing the status quo. Still, the story is familiar. Differential growth rates redistribute power in the system and change the expected net gains from system change. In turn, the altered cost-benefit ratio changes interests as well. The dominant state faces decline as consumption goes up and production and defence become more expensive. Skills that once gave it a comparative advantage gradually proliferate to less developed countries and a fiscal crisis occurs. In the rising state, the opposite happens: "lower costs, rising rates of return on their resources, and the advantages of backwardness"³¹⁶ gradually make it profitable to change the system. The hierarchy of prestige and the rights and rules of interaction, all established in the past, are undermined by the dramatic changes in the distribution of power. The dominant state can no longer impose its will on the rising state, and the rising state can start demanding changes. If the dominant power cannot counter the challenge and restore equilibrium, the stale mate over who will run the system is often settled through war.³¹⁷

If growth rates can cause so much harm, how do states behave to counter the threat? First, they can increase the resources devoted to maintaining their commitments and position in the international system, by, for example, increasing domestic taxation, collecting tribute from other states, manipulating the terms of trade, or increasing efficiency.³¹⁸ Second, they can try to reduce their existing commitments, without jeopardising their international position, by reducing costs, weakening or destroying the challenger, expanding to a more secure and less costly perimeter, or reducing international commitment through withdrawal, rapprochement, alliances, or concessions.³¹⁹

314 Ibid, 31

315 Ibid, 34.

316 Ibid, 185.

317 Ibid, 31-33.

318 Ibid, 188-193

319 Ibid.

In short, HST also rejects the first neorealist hypothesis and rather suggests that space wars are most likely to occur when there is a disequilibrium between the existing international system and the redistribution of space power towards those states that would benefit the most from changing the international system. Though HST accepts that the system is anarchic, it still suggests that international space politics is quite orderly due to a number of rights, rules, treaties and understandings. Furthermore, a dominant space power is expected to be on top of a hierarchy of space prestige based on both space capabilities and the reputation of using them successfully. Ultimately, HST suggests that space war most is likely to occur when different growth rates create a disequilibrium between the hierarchy of space prestige and the actual distribution of space power. Thus, space war could be a result of stalemates that occur when the dominant power, in spite of trying to allocate new resources and reduce space commitments, faces decline in space and the rising challenger suddenly can afford to change the system.

1.5 The First Partial Conclusion: The Case for A Widely Defined Neorealism

The fifth subchapter of Chapter I presents concluding remarks and reflections based on the findings of the thesis so far. The purpose of the thesis is to explain why a space war has not yet occurred, and the theoretical framework must serve that purpose. The first partial conclusion argues that IR theory is in fact applicable to international space politics, and that a widely defined neorealism that mixes concepts and conclusions from two opposing camps within the same theoretical body can best explain why there has never been a space war.

First of all, IR theory can be applied to international space politics. In fact, it has already been done in the past. The paradigms of IR still clash above the Kármán line because Earth and Space are not truly separated. Earth and Earth Space are so connected in Dolman's astropolitical regions just because the transition between them is so gradual. Space technology is made on the ground, launched from the ground, controlled and used on the ground. In other words, Slomczynska seems to be right in the claim that IR stands unchallenged even in the study of international space politics.

Realism seems well suited for studying the topic of space war. Classical and neoclassical realism appear useful in explaining states' foreign policy in space. However, since space war is an international outcome, a phenomena that result from the interaction of two or more actors in the international system, a systemic international relations theory is best suited to explain the likelihood of space war. With the help of techno-nationalist theory, realism seems to have, at least partly,

explained the behaviour of states in space.

Neorealism is built upon a small number of assumptions about the international system and its units. That involves good parsimony, but perhaps too much simplicity? A neorealist analysis would reduce international space politics to the interaction of similar units with the same functions regardless of domestic politics and culture. However, combining the explanatory power of defensive neorealism (DN), offensive neorealism (ON), power transition theory (PTT), and hegemonic stability theory (HST) with an eclectic approach will hopefully enrich the analysis.

Defensive neorealism (DN) suggests that the anarchical international system should force states to maximize space security through self-help behaviour and space power politics. States face the same tasks in space, but are differentiated by their amount of space power. Furthermore, DN suggests that states engage in balancing, buck-passing, post-war settlements and emulation in space, and that they can turn their wealth into space power to balance against the dominant space power

Offensive neorealism (ON), on the other hand, suggests that anarchy forces states to maximize space power instead of security and aim for space hegemony. However, the geography of space, like the geography of Earth, should make this a difficult task. Thus, ON suggests that states seek space hegemony, or at least aim to keep other great space powers from achieving it, through balancing, buck-passing, blackmail and war.

Power transition theory (PTT) suggests that a dominant state in the international system distributes wealth, security, prestige and power through an international space order. Some states are probably satisfied with the status quo in space, others not. Differentiated internal growth rates should mean that the relative distribution of space power in the international system is changing. Currently, there are huge space power gaps in the international system, but latecomers are catching up with the most powerful states in space. When a rising dissatisfied state reaches space power parity with the dominant state, the risk of space war should be at its highest.

Hegemonic stability theory (HST) goes even further than PTT in accepting the realist premiss of an anarchical international system, but suggests the existence of a hierarchy of space prestige based on material space capabilities, the willingness to use it, and various formal and informal rules. Different internal growth rates should influence the cost-benefit calculations of changing the status quo in space and gradually lead to a stalemate of space power which carries with it the risk of space war.

There are at least five good reasons why neorealism provides us with the most useful

theoretical toolkit for studying the absence of war in space. First, there is a gap in the literature. The existing literature, outlined above, seems to support realist explanations of international space politics more than those produced by competing theories. However, no one has purposefully applied several theories encompassed by neorealism side by side in a historical analysis of the entire Space Age. The goal of the thesis is to help fill that gap.

Second, the extended theoretical body associated with neorealism has produced clear and contradictory explanations as to why and when war is likely to happen. Neorealism is not great at accounting for the specific causal mechanisms leading to war without help from theories like neoclassical realism, which seeks to explain why states pursue particular strategies in the international arena. Neorealism can, however, account for the occurrence or absence of war without attributing it to the behaviour of any single state.

Third, the theories associated with neorealism have enough similarities to be used in combination. All the four theories have been made to study war and insecurity. They all consider great powers – the most powerful states – as the most important actors in international politics. Neorealist scholars do not deny the existence of international institutions, multinational companies or NGOs, but largely ignore non-state actors in their analyses because they rely on states for their security and survival. The distribution of power, defined as material, military capabilities, among the most powerful states is the essential explanatory variable for war.

Fourth, a widely defined neorealism, encompassing power transition theory and hegemonic stability theory, has enough internal diversity to generate a complex causal story about the absence of war in outer space. Neorealist scholars disagree on how the distribution of power affects state behaviour and on which distribution of power is the most war prone. Conclusions on the matter can be divided in two camps. The traditional conclusion is that a balance of power, in which there is no marked difference in power between the leading states, facilitates peace and stability by making the use of force too costly for single any state or alliance. Other scholars conclude that a preponderance of power, in which one state is far more powerful than the others, facilitates peace by making the most powerful state feel secure – attempts at challenging the leading state are doomed to fail.

Fifth, neorealism offers a worst-case scenario for international space politics. A future space war could have dire consequences for all humanity. Thus, the somewhat cynical world view of realism actually serves a purpose. Neorealism should not be the only perspective to explain international space politics, but it gives useful insight on competition and conflict in international space politics and probably also space war. If you assume the very worst when studying the past,

you could be positively surprised by future events. If you assume the best, a harsh reality might catch you by surprise.

The first partial conclusion makes the case for using a widely defined neorealism to explain the lack of space war so far in the Space Age. IR theory is in fact applicable to international space politics. Liberalism can explain international space regimes, space law, space institutions, space cooperation and spillover effects in the space sector. Constructivism can rules of behaviour certain ideas are valid and others not. Realism, however, seems to have the most explanatory power on the question of space war. Neorealism, if defined widely enough, provides explanations of war that are sufficiently similar and different. DN, ON, PTT and HST have enough internal diversity to generate a complex causal story of the absence of space war. In addition, neorealism offers a useful perspective on the worst-case scenario for international space politics. More importantly, the four theories all suggest that the causes of space war all lie in the distribution of space power. The well-known “big dogs” on Earth – the US, China, Russia – have the most material military space capabilities. They play the most important parts in the game of power, anarchy, competition, conflict, balancing, prestige and complex regimes in space. The history of international space politics will be explored in Chapter II.

CHAPTER II

A History of International Space Politics in the First and Second Space Age

*“Man transcends his element without ceasing to be man,
for he is Homo faber, the toolmaker, the technologist.
And man explores through idiosyncratic choice,
because he is also Homo pictor, the symbolist, the dreamer.”*

*– Walter McDougall, The Heavens and the Earth.*³²⁰

Chapter II presents an international political history of the Space Age which is analysed in Chapter III using the analytical framework established in Chapter I. The history revolves around the US, the USSR/Russia and China in the First and Second Space Age. All three states have made huge investments in space capabilities, both civilian and military, and successfully demonstrated technology few other actors in the world can match. The following history of these activities is purposefully descriptive in nature and based on Thies' guidelines for historical IR research³²¹ to minimize investigator bias and unwarranted selectivity. Historical sources are triangulated to verify facts, while explanations and interpretations are saved for Chapter III.

The Secure World Foundation has recently compiled and assessed publicly-available information on the counterspace capabilities being developed by the US, Russia and China.³²² The evidence shows significant research and development of a broad range of kinetic and non-kinetic counterspace capabilities, but only non-kinetic capabilities are actively being used in current military operations.³²³ The evidence shows that the US possesses the dual-use space capabilities necessary to develop all types of counterspace capabilities if it chooses to do so.³²⁴ There is strong evidence that Russia has embarked on a set of programs over the last decade to regain some of its Cold War-era counterspace capabilities.³²⁵ Ultimately, the evidence strongly indicates that China has a sustained effort to develop a broad range of counterspace capabilities.³²⁶

The second chapter is organised in four subchapters. The first three subchapters correspond

320 McDougall, *The Heavens and the Earth*, 3-4.

321 Thies, “A Pragmatic Guide to Qualitative Historical Analysis in the Study of International Relations.”

322 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, x.

323 Ibid.

324 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, x-xiii.

325 Ibid.

326 Ibid.

with the three state actors under analysis. Each of the subchapters begin with an overview before three distinct sections. The first section is a brief historical background to contextualise the state's relationship with space up until 1957. The second and third section correlate with the First and Second Space Age. The fourth and final subchapter – the second preliminary conclusion of the thesis – points out the striking similarities and interconnectedness of history in space and on Earth. It argues that IR theory is fit for the task of analysing international space politics because “space history is Earth history”. Space is part of the international system. The risk of space capabilities being used together with nuclear weapons in a potential WWIII was high and will remain high going into the future. In short, the causes of space war are associated with the more familiar causes of major war.

2.1 The US in Space

The first subchapter of Chapter II presents a descriptive, contextualised international political history of the US in space during the First and Second Space Age. Today, the US state is the world's largest space program (*See Figure 1*).³²⁷ The largest de-facto space program is not NASA, but the US military.³²⁸ The US has 849 operating satellites (*See Figure 7*)³²⁹, a two-digit number of spaceports, Cape Canaveral being the most important, and a wide variety of SLVs, including the Atlas, Delta, Falcon and Antares series, which can lift everything from microsatellites to heavy payloads into orbit.³³⁰

According to the Secure World Foundation's latest open source assessment of counterspace capabilities³³¹, the US currently has the best military space capabilities in the world. The US also has the most experience putting their military space capabilities to use in actual conflicts. In co-orbital ASATs, the US has tested dual-use satellites like DART, XXS-10 and -11, Orbital Express, Prowler, MiTeX, GSSAP and Angels. No direct-ascent ASAT program has been acknowledged, but the US has tested both conventional and nuclear ASATs in past and tested dual-use ABM systems like the Ground-based Midcourse System (GMD) and ship-based Aegis system, which both represent a large and flexible capability in future conflict. Additionally, the US can jam satellites,

327 Mark Hilborne, “China's Rise in Space and US Policy Responses: A Collision Course?” *Space Policy* 29, no. 2. (2013): 122-123, <https://doi.org/10.1016/j.spacepol.2013.03.005>.

328 Johnson-Freese, *Space as a Strategic Asset*, 23.

329 “UCS Satellite Database.”

330 Jeff Foust, “United States Space Launch Programs,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 725-742.

331 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*.

including the Russian GLONASS and Chinese Beidou GNSS systems, as far away as GEO through its operational electronic warfare system Counter Communications System (CCS).

2.1.1 Historical Context

Physics professor Robert Goddard carried out cutting-edge military rocket research for the US government during WWI. In 1940, Goddard's team launched the most advanced rocket in the world outside Germany, but its research was largely ignored by the US military until Japan's attack on Pearl Harbor in 1941.³³² In the final phase of WWII, the US raced the USSR to capture German scientists and rockets, and Operation Paperclip transferred more than 120 German scientists - including lead scientist Werner von Braun – and 100 V-2 rockets to the US Army in New Mexico.³³³

In the first decade after WWII, low spending, inter-service rivalry, military conservatism, bureaucratic red tape and indecision among policymakers left US ballistic missile and satellite development trailing far behind that of the USSR.³³⁴ The CIA estimates that the US spent around 14 percent on the military of its national product on the military between 1945 and 1957, while the USSR spent about 20 percent.³³⁵ The US Air Force, Army and Navy all had their own small missile research programs, but a superiority in bomber planes made military space a non-priority.³³⁶ In 1945, for example, the US Navy sponsored a satellite research program, but it was quickly cancelled.³³⁷ In 1946, the US Army Air Force started Project RAND to research future weapons.³³⁸ Later that year, a RAND report concluded that the US could launch a satellite within five years and that satellites would help the development of ICBMs, weather forecasting, damage assessment, communications, navigation and weapons targeting.³³⁹ In October 1946, the US took the first ever picture of Earth from space using a modified V-2 rocket.³⁴⁰

In the mid-1950s, a growing nuclear threat from the USSR led to a substantial increase in US spending on missile and satellite research.³⁴¹ In 1953, when the USSR tested its first hydrogen bomb and demonstrated improved ballistic missile technology, US funding for missile research rose

332 Sheehan, *The International Politics of Space*, 36-37.

333 Harding, *Space Policy in Developing Countries*, 34-35.

334 Sheehan, *The International Politics of Space*, 38.

335 Harding, *Space Policy in Developing Countries*, 41-42.

336 Sheehan, *The International Politics of Space*, 38.

337 Ibid, 39.

338 Hays, *Space and Security*, 2

339 Ibid.

340 Harding, *Space Policy in Developing Countries*, 41.

341 Sheehan, *The International Politics of Space*, 38.

sharply to US\$3 million.³⁴²³⁴³ The US prioritized work on photoreconnaissance satellites and the creation of an international legal regime that would legitimize their use to improve its intelligence on the closed Soviet state.³⁴⁴ In 1954, the top secret Technological Capabilities Panel, commissioned by president Eisenhower to prevent another Pearl Harbor, suggested that the principle of freedom of space could be established in international law by launching a small satellite.³⁴⁵ Meanwhile, a report urged the US Air Force (USAF) to secretly develop and deploy a spy satellite as soon as possible, labelling it a “vital strategic interest”³⁴⁶. The first US satellite program, named WS-117L, was eventually started by USAF in November 1954 and would lay the scientific groundwork for all the main types of reconnaissance and surveillance satellites used over the next three decades.³⁴⁷³⁴⁸

The year of 1955 was highly important in US space history. First, USAF set requirements for WS-117L and began work on the higher-priority Atlas ICBM program.³⁴⁹ Second, the budget allocation for missile research rose to US\$161 million.³⁵⁰ Third, the US announced plans to launch a small satellite during the International Geophysical Year (IGY), a period of maximum solar activity during 1957-1958, in which 67 countries - including the USSR - would agree to participate.³⁵¹ Fourth, the US announced the “Open Skies” initiative designed to allow overflights in space, which was quickly turned down by the USSR.³⁵² Fifth, the secret directive “United States Scientific Satellite Program” (NSC 5520), issued by the National Security Council (NSC), decreed that the SLV for the first US satellite should not be military in nature, gave impetus to the production of spy satellites, the U-2 spy plane and the first Intermediate Range Ballistic Missile (IRBM), and stressed a satellite's importance to US security, role in legitimizing future spying, and benefits in terms of psychological warfare, prestige and propaganda.³⁵³ Ultimately, in line with the constraints of NSC 5520, the US decided to launch the IGY satellite under the US Navy's Vanguard programme with an upgraded version of the Viking sounding rocket – the only non-military option available at the time.³⁵⁴

342 Harding, *Space Policy in Developing Countries*, 42.

343 The report, which suggested that the USSR would develop ballistic missiles with a range of 3,700 kilometres by 1957, triggered the CIA to monitor Soviet missile tests from Turkish territory.

344 Hays, *Space and Security*, 2-3.

345 Ibid, 4.

346 Sheehan, *The International Politics of Space*, 38.

347 Hays, *Space and Security*, 4-5.

348 The WS-117L program laid the groundwork for the following satellite systems and programs: 1) reconnaissance via recoverable film systems under CORONA; 2) infrared surveillance for missile launch detection under MIDAS; 3) reconnaissance via electro-optical systems under SAMOS.

349 Ibid.

350 Harding, *Space Policy in Developing Countries*, 42.

351 McDougall, *The Heavens and the Earth*, 118-119.

352 Harding, *Space Policy in Developing Countries*, 44.

353 Ibid, 43.

354 Hays, *Space and Security*, 7

2.1.2 The US in the First Space Age

The start of the Space Age was a traumatic event in the US. In the fall of 1957, the USSR successfully launched Sputnik I and Sputnik II, effectively destroying the perception of US superiority in science and technology.³⁵⁵ Traditionally, two large oceans had worked as defensive buffers between the US and the USSR, but new dual-use rocket technology suddenly made them less important.³⁵⁶ The US subsequently overestimated the USSR's missile capabilities, spreading the idea of a "missile gap" between the two superpowers.³⁵⁷ President Eisenhower initially tried to downplay the Sputniks' political significance and even congratulated the Soviets, but US media painted a picture filled with self-doubt, fear and hysteria. Newsweek Magazine, for example, asked whether "the crushers of Hungary could be trusted with this new kind of satellite"³⁵⁸. But the media was not alone in handing out such warnings. Senator Henry Jackson, US Information Agency director George Allen, and the NSC all separately declared that the Soviet space program challenged US security, prestige, and scientific and technical leadership.³⁵⁹

The US responded to the Soviet Sputnik launches by investing massively in space science and education and reorganising the military space sectors. Ultimately, the response resulted in the "white space program", the "blue space program", and "the black space program".³⁶⁰ The white was led by NASA, the blue was run by the Department of Defense (DOD), and the black was run by the intelligence agencies. President Eisenhower quickly created the Presidential Science Advisory Committee (PSAC) to allay public fears after numerous congressional inquiries revealed a highly fragmented space program.³⁶¹ Senator Lyndon Johnson's Preparedness Subcommittee hearings led to a final report saying: "We are in a race for survival and we intend to win that race"³⁶². The DOD created the Advanced Research Project Agency (ARPA) to direct all military space programs and accelerated the development of the Minuteman ICBM.³⁶³³⁶⁴ USAF began working on the manned spaceflight program Man in Space Soonest (MISS).³⁶⁵ On December 6, 1957, however, the first US satellite, Vanguard TV-3, exploded on the launch pad on live television.³⁶⁶ The Washington Post concluded that the US was facing "cataclysmic peril in the face of rocketing Soviet military

355 Ibid.

356 Harding, *Space Policy in Developing Countries*, 49-50.

357 Sheehan, *The International Politics of Space*, 27.

358 Ibid, 29.

359 Ibid, 21, 40-41.

360 Hays, *Space and Security*, 7.

361 Sheehan, *The International Politics of Space*, 41.

362 Hays, *Space and Security*, 10.

363 Sheehan, *The International Politics of Space*, 45.

364 Hays, *Space and Security*, 10

365 Harding, *Space Policy in Developing Countries*, 48.

366 Hays, *Space and Security*, 9.

might”³⁶⁷.

The seriousness of the US response to the USSR in space became evident during 1958. On January 31, the first US satellite, Explorer I, was launched into orbit from Cape Canaveral, Florida.³⁶⁸ A few days later, Eisenhower gave ICBMs, IRBMs and satellites highest national priority. In August, the first comprehensive US space policy, “Statement of Preliminary U.S. Policy on Outer Space” (NSC 5814/1), was approved in secret.³⁶⁹ In October, NASA was established with 8,000 employees, including the Army’s best rocket scientists, and US\$100 million at its disposal.³⁷⁰³⁷¹ In the same piece of legislation, science and technology education was given a US\$188 million boost.³⁷²³⁷³ NASA got authority over manned spaceflight under Project Mercury, but DOD kept the final word on NASA’s space activities.³⁷⁴ In November, after almost a year of US-Soviet talks, COPUOS was created as a part of the UN, adopting the US wording “peaceful purposes” rather than “nonmilitary purposes”.³⁷⁵ Meanwhile, the MIDAS early-warning satellite and the Advent communications satellite were cancelled because they were considered too provocative and costly.³⁷⁶

The burgeoning international space regime allowed the US to increase satellite spying, test ground-based ASAT weapons and conduct cutting-edge space R&D.³⁷⁷ In the late 1950s, the US conducted two high-altitude nuclear detonations, the world’s first conventional ASAT test, and began R&D efforts on the short-lived SAINT satellite interception and inspection system.³⁷⁸ Around the the same time, the X-15 program demonstrated the feasibility of hypersonic travel in near space, and research on the X-20 Dyna-Soar – a hypersonic, suborbital space plane – was approved.³⁷⁹ In 1960, the Corona spying program became the world’s first operational satellite photo-reconnaissance system – providing the US with new intelligence that debunked the idea of a “missile gap”.³⁸⁰ Later that year, the classified National Reconnaissance Office (NRO) was created after the CIA got more involved in Corona.³⁸¹ By 1961, the US had launched almost five times more

367 Sheehan, *The International Politics of Space*, 44.

368 Hays, *Space and Security*, 9.

369 Ibid, 11.

370 Sheehan, *The International Politics of Space*, 42.

371 Harding, *Space Policy in Developing Countries*, 54.

372 Ibid, 48.

373 Sheehan, *The International Politics of Space*, 42.

374 Hays, *Space and security*, 22.

375 Ibid, 16.

376 Sheehan, *The International Politics of Space*, 45.

377 Ibid, 40-46.

378 Hays, *Space and Security*, 17-18.

379 Clayton K. S Chun, “Viewpoint: Expanding the High Frontier: Space Weapons in History,” *Astropolitics* 2, no. 1 (2004): 71-72, <https://doi.org/10.1080/14777620490444759>.

380 Hays, *Space and security*, 12.

381 Sheehan, *The International Politics of Space*, 44

satellites than the USSR³⁸², including the first ever remote sensing weather satellite.³⁸³

With Kennedy as president, the US prioritized human spaceflight to land a man on the moon, supported the international space regime and negotiated space-related arms-control. In his inaugural address in 1961, Kennedy, who had roasted Eisenhower over the missile gap during the election, called for superpower cooperation in space and promised to push the US to a “new frontier”.³⁸⁴ Three consecutive events early in 1961 – the March 25 Mercury explosion, the April 14 Gagarin spaceflight, and the April 17 Bay of Pigs fiasco – triggered the largest US space program to date: the Apollo manned moon landing program.³⁸⁵³⁸⁶ After getting joint support from NASA and DOD, Kennedy committed the US to achieving the goal within the decade.³⁸⁷³⁸⁸ Meanwhile, fears of Soviet orbital nuclear weapons gave US ASAT development a new sense of urgency.³⁸⁹ At COPUOS, the US proposed that all states should register their space launches while emphasizing the peaceful nature of its own space policy.³⁹⁰ In 1963, following the Cuban Missile Crisis, arms control negotiations resulted in the Limited Test Ban Treaty and the UNGA Resolution 1884.³⁹¹ In the fall of 1963, two months after the Soviet Cosmos 21 Mars lander failure and two months before his own death, Kennedy suggested a joint US-Soviet moon landing.³⁹²

After Kennedy’s assassination in November 1963, president Johnson kept expanding the US space program, especially in manned spaceflight and satellite launches. The \$660 million manned X-20 Dyna-Soar program was cancelled³⁹³³⁹⁴, but the US tested³⁹⁵ and deployed two nuclear-tipped ASATs – the Army’s Program 505 and USAF’s Program 347 – in the Pacific.³⁹⁶ The 505 and 347 ASATs were tested three more times, but president Johnson remained sceptical to their military utility.³⁹⁷ Apollo, however, was given much higher priority than the many bold military space programs proposed by USAF at the time.³⁹⁸ As NASA’s budget rose from \$964 million in 1961 to

382 Ibid, 29.

383. “Tiros 1,” *NASA Space Science Data Coordinated Archive*, accessed April 27, 2019, <https://nssdc.gsfc.nasa.gov/nmc/spacecraftDisplay.do?id=1960-002B>.

384 Sheehan, *The International Politics of Space*, 41, 47.

385 Ibid, 48-49.

386 Hays, *Space and Security*, 19.

387 Sheehan, *The International Politics of Space*, 47-49.

388 Harding, *Space Policy in Developing Countries*, 58.

389 Matthew Mowthorpe, “US Military space policy 1945–92,” *Space Policy* 18, no. 1 (2002): 25-36, [https://doi.org/10.1016/S0265-9646\(01\)00055-8](https://doi.org/10.1016/S0265-9646(01)00055-8).

390 Hays, *Space and Security*, 20-21.

391 Mowthorpe, “US Military space policy 1945–92,” 27.

392 Harding, *Space Policy in Developing Countries*, 60.

393 Chun, “Viewpoint: Expanding the High Frontier: Space Weapons in History,” 72.

394 Mowthorpe, “US Military space policy 1945–92,” 27.

395 A 1.4 megaton US nuclear test in space, dubbed “Starfish Prime”, knocked out all seven satellites in LEO and much of Hawaii’s communication.

396 Hays, *Space and Security*, p. 17-18.

397 Mowthorpe, “US Military space policy 1945–92,” 27.

398 Hays, *Space and Security*, 18

\$5.1 billion by 1964, the DOD's budget rose from \$814 million to only \$1.6 billion.³⁹⁹ The Mercury spacecraft produced two suborbital manned flights before Glenn became the first American in space in 1962, followed by two additional one-man missions in 1963.⁴⁰⁰ Between 1964 and 1966, the two-man Gemini spacecraft produced an unmanned flight, a manned flight, the first American spacewalk, a rendezvous in orbit and the first successful docking in orbit.⁴⁰¹ In 1967, the OST was signed by 62 states and unanimously approved in the US Congress under the clear assumption that the treaty did not ban ASAT-weapons.⁴⁰² After a fire killed three astronauts in 1967, the Apollo mission successfully sent humans beyond Earth space to circumnavigate the Moon for the first time in 1968 before famously landing Armstrong, Aldrin and Collins on the Moon on July 20, 1969.⁴⁰³ However, the Apollo success came at a price. The program cost US\$25 billion – nearly 4,5 percent of the federal budget – and distorted other objectives in space, especially in military manned spaceflight.⁴⁰⁴ For example, the Manned Orbiting Laboratory (MOL) was cancelled in 1969⁴⁰⁵. The total number of US satellite launches peaked in the 1960s at nearly 80 per yer.⁴⁰⁶

In the 1970s, under presidents Nixon, Ford and Carter, the US prioritized force-enhancing and early warning military satellite capabilities, non-nuclear ASATs and bilateral space cooperation with the USSR while slowing down its satellite launch rate. The cost-conscious Nixon administration immediately established a Space Task Group to review future space plans.⁴⁰⁷ The 505 and 437 ASAT programs were scaled down when several NSC studies concluded that the US was more dependent on satellites than the USSR.⁴⁰⁸ In 1970, Nixon endorsed the space shuttle as the primary post-Apollo goal in space, before approving the dual-use Space Transportation System (STS) design two years later.⁴⁰⁹ From the beginning, USAF required a shuttle that could place spy satellites in polar orbit⁴¹⁰, and its rationale grew even more militarized when DOD had to save it economically under president Carter.⁴¹¹ Signed on May 26, 1972, SALT I, which relied on spy satellites for verification and legitimization, prohibited space-based ABM systems under the ABMT.⁴¹² That year, the first civilian remote-sensing satellite, Landsat, was launched.⁴¹³ Later in

399 Ibid, 19-20.

400 Sheehan, *The International Politics of Space*, 50.

401 Ibid.

402 Hays, *Space and security*, 23-24.

403 Harding, *Space Policy in Developing Countries*, 60.

404 Ibid.

405 Mowthorpe, "US Military space policy 1945–92," 28.

406 Weeden, "U.S.-China Cooperation in Space: Constraints, Possibilities, and Options," 117.

407 Mowthorpe, "US Military space policy 1945–92," 28.

408 Hays, *Space and security*, 29-30.

409 Ibid.

410 Harding, *Space Policy in Developing Countries*, 56.

411 Hays, *Space and Security*, 29.

412 Harding, *Space Policy in Developing Countries*, 65.

413 Ibid, 76.

the decade, in the spirit of détente, the Apollo-Soyuz Test Project of 1975 symbolised a “handshake in space” between the US and USSR, and several Soviet launches would carry US biological experiments into orbit.⁴¹⁴ In 1977, president Ford authorized a non-nuclear ASAT that would become the Miniature Homing Vehicle (MHV).⁴¹⁵ In 1979, president Carter issued PD-37, the first National Space Policy since Eisenhower, which included an aggressive long-term program for military space systems.⁴¹⁶ Carter continued the MHV ASAT program while engaging in secret ASAT negotiations with the USSR due to fears of its growing conventional ASAT arsenal.⁴¹⁷ However, the talks broke down over issues like the dual-use STS design, the Soviet invasion of Afghanistan and Reagan’s election victory.⁴¹⁸ By the end of the decade, the US had revolutionized military operations and fielded the GPS system, by deploying comprehensive military space capabilities that are still operational in updated form, including surveillance, communication and navigation satellites and an electro-optical system providing direct data downlink in near-real time.⁴¹⁹

The US under president Reagan invested heavily in military space systems and largely opposed space-related arms-control. In 1981, the Columbia Space Shuttle became the world’s first reusable spacecraft two years behind schedule and US\$2 billion over budget⁴²⁰ – a vehicle the Soviets considered to have ASAT potential.⁴²¹ During the same year, the US military space budget surpassed that of NASA for the first time in three decades.⁴²² The Space Station named Freedom program was born, paving the way for the ISS.⁴²³ Despite significant space cooperation with the USSR in the late 1970s and early 1980s, the US under Reagan broke off virtually all cooperation following the Soviet invasion of Afghanistan and imposition of martial law in Poland.⁴²⁴ In his first speech on space policy, Reagan underlined the importance of assuring access to space.⁴²⁵ Shortly after, Reagan first formal space policy⁴²⁶, called NSDD-42, the US reemphasised that space systems were considered national assets and included a program to deny the enemy use of space and space assets in a time of war and crisis.⁴²⁷ During the period, the Air Force Space Command (AFSPC)

414 Sheehan, *The International Politics of Space*, 65

415 Mowthorpe, “US Military space policy 1945–92,” 28.

416 Ibid.

417 Moltz, *Crowded Orbits*, 50.

418 Hays, *Space and Security*, 30-31.

419 Ibid, 27.

420 Ibid, 29.

421 Mutschler, “Security Cooperation in Space and International Relations Theory,” 51.

422 McDougall, *The Heavens and the Earth*, 434.

423 David A. Turner and James Vedda, “The Impact of Foreign Space Developments on US Defense Policy,” in *Space and Defense Policy*, ed. Damon Coletta and Frances Pilch (Hoboken: Taylor and Francis, 2013), 318.

424 Sheehan, *The International Politics of Space*, 66-67.

425 Dave Webb, “Space weapons: dream, nightmare or reality?” in Bormann Natalie Bormann and Michael Sheehan, eds., *Securing Outer Space* (Abingdon: Routledge, 2009), 33.

426 The space policy was part of the National Security Decision Directive (NSDD-42) of 1982.

427 Webb, “Space weapons: dream, nightmare or reality?” 33-34.

was created.⁴²⁸

Reagan's famous "Star Wars" speech, held on March 23, 1983, initiated the Strategic Defense Initiative (SDI) to investigate if space could be utilized for a layered, strategic defence of the entire US population against a massive Soviet nuclear attack.⁴²⁹⁴³⁰⁴³¹ In his speech, Reagan called upon the US scientific community to render USSR nuclear weapons obsolete.⁴³² After the speech, two feasibility studies – the Fletcher Committee and the Hoffman Study – rendered a perfect, global ABM system practically impossible.⁴³³ Still, one year later, the Strategic Defense Initiative Organization (SDIO) was chartered to research and develop the necessary technology.⁴³⁴ The SDIO proposed to put a ABM system of thousands of kinetic interceptors and lasers in space to defend the country against the nuclear weapons of the USSR.⁴³⁵ The goal of the SDI, under which "ASAT projects were adapted for use as anti-ballistic missiles (ABMs) and vice versa"⁴³⁶, aimed to "develop US technological advantage, bind America's allies closer, and to push the struggling Soviet economy to its limit"⁴³⁷. ASAT projects were adapted for use as anti-ballistic missiles (ABMs) and vice versa. The SDI was "a critical development"⁴³⁸ for the USSR because it would practically end the nuclear deterrence doctrine of mutual assured destruction (MAD) and render its second-strike nuclear capabilities useless.⁴³⁹ When the USSR demanded that the SDI would be confined to laboratory research, the US declined⁴⁴⁰ – clearly ending the period of détente in space.⁴⁴¹

In 1984, USAF flight tested the Miniature Homing Vehicle (MHV) ASAT system for the first time, and then, in 1985, used the system – based on a small arsenal of ASM-135 air-launched missiles⁴⁴² – to intercept a satellite in space.⁴⁴³ After the test, US Congress prohibited further ASAT testing unless the USSR conducted one first.⁴⁴⁴ The 1986 *Challenger* accident led to a more balanced US reliance on reusable and expendable launchers.⁴⁴⁵ In 1986, space-based infrared sensors and kinetic weapons performed simulated boost-phase intercepts in a SDI-related

428 Hays, *Space and Security*, 32-33.

429 Ibid, 34.

430 Mowthorpe, "US Military space policy 1945–92," 29-30.

431 Moltz, *Crowded Orbits*, 50-51.

432 Sheehan, *The International Politics of Space*, 177.

433 Webb, "Space weapons: dream, nightmare or reality?" 33-34.

434 Mowthorpe, "US Military space policy 1945–92," 29-30.

435 Hays, *Space and Security*, 35.

436 Webb, "Space weapons: dream, nightmare or reality?" 29-30.

437 Sheehan, *The International Politics of Space*, 177.

438 Ibid, 67.

439 Ibid, 102.

440 Mowthorpe, "US Military space policy 1945–92," 30.

441 Sheehan, *The International Politics of Space*, 177.

442 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, 38.

443 Hays, *Space and Security*, 38.

444 Mowthorpe, "US Military space policy 1945–92," 29.

445 Hays, *Space and Security*, 29-30.

experiment.⁴⁴⁶ By 1987, however, the US had – despite scepticism towards Soviet change – yet again developed a working relationship with the USSR on deep space explorations.⁴⁴⁷ In 1988, the US space station program was designated as Space Station Freedom for political propaganda, triggering the renaming of the Soviet space station to Mir – the Russian word for peace.⁴⁴⁸ Nonetheless, a revised national space policy, also issued in 1988, reflected nearly a decade of US space development and embraced USAF's typology of space support, force enhancement, space control and force application.⁴⁴⁹ And by the same year, the SDI project had evolved into the “Brilliant Pebbles” system, which consisted of a number of single kinetic interceptors and associated tracking systems.⁴⁵⁰

President Bush continued along president Reagan's political path in space and created the National Space Council,⁴⁵¹ issued a new National Space Policy and several National Space Policy Directives (NSPDs).⁴⁵² Intensive research effort on the SDI continued under the Bush administration, but the US military was unable to “overcome the enormous technological obstacles to creating such a defensive system”⁴⁵³. After China's fierce crackdown at Tiananmen Square in 1989, the US imposed economic sanctions, including a prohibition on the export of dual-use satellite technology.⁴⁵⁴

2.1.3 The US in the Second Space Age

In clear contrast to beginning of the First Space Age, the US entered the Second Space Age as the leading global space power. When the USSR collapsed, the US reoriented the SDI towards regional instead of global conflicts, and ABM systems like THAAD and Aegis began seeing the light of day.⁴⁵⁵ Operation Desert Storm was named the first “space war” because the US demonstrated a clear superiority in force-enhancing military space capabilities, which provided advantages in navigation, communications, commercial imaging and weather prediction, by defeating Iraq, the world's fourth largest army, in only 10 days.⁴⁵⁶ The US also took the lead in the commercial satellite manufacturing field with an average market share of more than 80

446 Ibid, 35.

447 Moltz, *Crowded Orbits*, 50-51.

448 Sheehan, *The International Politics of Space*, 102.

449 Hays, *Space and Security*, 32.

450 Webb, “Space weapons: dream, nightmare or reality?” 29-30.

451 Hays, *Space and Security*, 33

452 Ibid, 38.

453 Sheehan, *The International Politics of Space*, 177.

454 Harding, *Space Policy in Developing Countries*, 87.88.

455 Mowthorpe, “US Military space policy 1945–92,” 31.

456 Everett C. Dolman, “Increasing the Military Uses of Space” in *Toward a Theory of Space Power: Selected Essays*, ed. Charles D. Lutes and Peter L. Hays with Vincent A. Manzo. Lisa M. Yambrik, and M. Elaine Bunn (Washington, DC: Institute for National Strategic Studies - National Defense University, 2011).

percent.⁴⁵⁷ However, the early 1990s saw restrictions on the deployment of space-based interceptors⁴⁵⁸, congressional bans on the MIRACL chemical laser and Army direct-ascent ASAT program linked to the SDI,⁴⁵⁹ as well as the cancellation of the X-30 manned space vehicle.⁴⁶⁰

Under president Clinton, the US invested in the ISS, began efforts to safeguard US satellites from attack, and tightened export controls on dual-use space technology. In 1993, vice president Gore announced that Russia would join the ISS and the Missile Technology Control Regime (MTCR), for which the US paid Russia an initial sum of \$400 million and a total of \$800 million in ISS funding from 1994 to 1998.⁴⁶¹ In 1995, the Global Positioning System (GPS) achieved full operational capability with 24 satellites providing precise PNT to civilian and military users, for example supporting precision weapons like gravity bombs to cruise missiles.⁴⁶² In 1996, Clinton released a National Space Policy stating that “purposeful interference with space systems shall be viewed as an infringement on sovereign rights”⁴⁶³ and urging that “directs that steps be taken to protect against attack through such measures as deploying sensors on satellites, hardening them to electromagnetic effects and radiation and improving the security of ground stations and communication links”⁴⁶⁴. That same year, the ban on the Army’s direct-ascent ASAT and MIRACL chemical laser was lifted, and the system was tested against a US satellite in 1997.⁴⁶⁵ In the late 1990s, the US placed Chinese commercial satellites and related technologies under International Traffic in Arms Regulations (ITAR) as well as on the State Department’s Munitions List due to the Strom Thurmond National Defense Authorization Act for Fiscal Year 1999.⁴⁶⁶

The US continued to invest heavily in space through the early 2000s in both the military and civilian sector, while acting on a more aggressive space police doctrine and pulling out of the ABMT. The primacy of military space was codified in under Bush.⁴⁶⁷ Already in the late 1990s, the Rumsfeld Commission warned of new “space pearl harbor” and outlined a bold new space strategy, calling for urgent action to protect vulnerable space capabilities through deterrence and defence: “we know from history that every medium—air, land and sea—has seen conflict. Reality indicates

457 Harding, *Space Policy in Developing Countries*, 88.

458 Mowthorpe, “US Military space policy 1945–92,” 32.

459 Webb, “Space weapons: dream, nightmare or reality?” 29-30.

460 Hays, *Space and Security*, 36.

461 Mowthorpe, “US Military space policy 1945–92,” 32.

462 Morgan E. Forrest, *Deterrence and first-strike stability in space: A Preliminary Assessment* (Santa Monica: Rand Corporation, Project Air Force, 2010), 13.

463 The White House, *Presidential Decision Directive NSTC-8 (NSC-49)* (Washington, D.C.: National Science and Technology Council, 1996).

464 Ibid.

465 Webb, “Space weapons: dream, nightmare or reality?” 29-30.

466 “H.R.3616 - Strom Thurmond National Defense Authorization Act for Fiscal Year 1999,” *United States Congress*, accessed April 27, 2019, <https://www.congress.gov/bill/105th-congress/house-bill/3616>.

467 Harding, *Space Policy in Developing Countries*, 56.

that space will be no different”⁴⁶⁸. When Rumsfeld became Secretary of Defense, military doctrine changed from being threat-based to becoming capabilities-based and came to focus on concepts like “space superiority” and “space dominance”. Throughout the period, the US focused on developing a full spectrum of space capabilities to support national security objectives, including global satellite communications, remote sensing and PNT. In 2002, the US withdrew from the ABMT⁴⁶⁹, US: approved funding for selective counterspace capabilities⁴⁷⁰, created the Missile Defense Agency (MDA)⁴⁷¹, and began conditionally sharing military satellite data with Taiwan⁴⁷². The decision was arguably due to the ABMT being outdated after the Cold War, but the move also allowed the US to restart development of operational, local ABM systems⁴⁷³ after Russian weapons sales proliferated military space capabilities⁴⁷⁴. The decision also prompted increased lobbying for space arms control reform by Russia and China.⁴⁷⁵

The Afghanistan and Iraq wars – operations Enduring Freedom and Iraqi Freedom – demonstrated far more superior US military space capabilities than ever before, but also revealed an growing US vulnerability in space. Compared to Desert Storm, the percentage of precision-guided air-delivered munitions rose from 8 to 70, while communication speeds to battle units rose 50 times.⁴⁷⁶ The war made China even more aware of the US military dependence on space.⁴⁷⁷ In 2003, however, the Columbia Space Shuttle exploded, killing all seven astronauts on board.⁴⁷⁸ The accident gave China an opening on the global market.⁴⁷⁹ The second Bush administration “brought into office a group of neoconservative thinkers that perceived US space systems as vulnerable and concluded that the weaponization of space could be the cure to this problem”⁴⁸⁰. In 2004, the US military released a document entitled “Counterspace operations” in which they wrote that “adversaries will target space capabilities in an attempt to deny that combat advantage”⁴⁸¹, so “[w]e must also be prepared to deprive an adversary of the benefits of space capabilities when American

468 “Anti-Ballistic Missile Treaty,” *Federation of American Scientists*, accessed April 27, 2019, <https://fas.org/nuke/control/abmt/>.

469 “U.S. Withdrawal From the ABM Treaty: President Bush’s Remarks and U.S. Diplomatic Notes.”

470 Heginbotham, Eric et al., *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017* (Santa Barbara: RAND Corporation, 2017).

471 “MDA History,” *Missile Defense Agency*, accessed April 27, 2019, <https://www.mda.mil/about/history.html>.

472 Liao Shu-Hsien, “Will China Become a Military Space Superpower?” *Space Policy* 21, no. 3 (2005): 205-212, <https://doi.org/10.1016/j.spacepol.2005.05.009>.

473 Steven Freeland, “The Laws of War in Outer Space,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 84-86.

474 Dolman, *Astropolitik*, 159-160.

475 Ibid.

476 Hays, *Space and Security*, 51.

477 Erik Seedhouse, *The New Space Race: China vs. The United States* (Chichester: Praxis Publishing Ltd, 2010), 74.

478 Mike Wall, “Challenger Disaster 30 Years Ago Shocked the World, Changed NASA exploded,” *SPACE.com*, January 28, 2016, <https://www.space.com/31760-space-shuttle-challenger-disaster-30-years.html>.

479 Sheehan. *The International Politics of Space*, p. 163.

480 Mutschler, “Security Cooperation in Space and International Relations Theory,” 46.

481 “Counterspace Operations: Air Force Doctrine Document 2-2.1,” *United States Air Force*, accessed April 27, 2019, https://fas.org/irp/doddir/usaf/afdd2_2-1.pdf.

interests and lives are at stake”⁴⁸². The Counter Communications System (CCS) became operation that same year.⁴⁸³ The US protested the European Galileo GNSS system and also put pressure on Europe not to lift its arms embargo on China.⁴⁸⁴ In the 2006 directive on US Space Transportation Policy, Bush codified the primacy of military space and made national security objectives a priority, downplaying civilian and cooperative activities. The 2006 National Space Policy emphasized “space control”, “freedom of action in space”, “national interest” and US opposition to new space regimes⁴⁸⁵ – and opened the door for preemptive strikes also in space.⁴⁸⁶ As military space was prioritized, the US focused its human spaceflight program on trips to LEO and space stations using the space shuttle. In addition, the US conducted missions with robotic exploration, remote sensing of the Earth from space for climate monitoring and meteorology. When China tested an ASAT in 2007, the US quickly responded by blocking the PPWT draft treaty⁴⁸⁷ and destroying a failed US reconnaissance satellite in space with its own conventional ASAT in 2008.⁴⁸⁸ However, as a number of other countries, including Russia, formally protested, the US kept a relatively low profile due to its own military space doctrine, capabilities and history of ASAT tests in the First Space Age.⁴⁸⁹

Under president Obama, the US engaged more in space cooperation, but never strayed far from its focus on national security in space. Obama tried to adjust to a range of new space actors through diplomacy, arms control, TCBMs, by abstaining instead of voting against a Sino-Russian space treaty draft at the UN, and endorsing the EU Code of Conduct.⁴⁹⁰ Both the 2010 US National Space Policy and the 2011 National Security Space Strategy were moderate compared to previous documents. Smith argues that the National Space Policy is “particularly striking for its change in tone from the previous policy issued by President George W. Bush”⁴⁹¹. Brachet and Pasco writes that the policy “does indeed avoid the strong, rather undiplomatic, language of the 2006 version, which surprised many of the USA’s space partners worldwide”.⁴⁹² However, the 2011 National Security Space Strategy refers to space as “increasingly congested, contested and competitive” and

482 Ibid.

483 Heginbotham et al., *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017*.

484 Johnson and Erickson, “The Emerging China–EU Space Partnership.”

485 The White House, *U.S. National Space Policy* (Washington, D.C.: Office of Science and Technology, 2006).

486 Johnson-Freese, *Space as a Strategic Asset*, 20.

487 “Treaty on the Prevention of the Placement of Weapons in Outer Space, the Threat or Use of Force against Outer Space Objects(Draft),” *Ministry of Foreign Affairs of the People's Republic of China*, accessed April 27, 2019, http://www.fmprc.gov.cn/mfa_eng/wjb_663304/zzjg_663340/jks_665232/kjfywj_665252/t1165762.shtml

488 Grego, *A History of Antisatellite Programs*.

489 Gene V. Milowicki and Joan Johnson-Freese, “Strategic Choices: Examining the United States Military Response to the Chinese Anti-Satellite Test,” *Astropolitics* 6, no. 1 (2018): 1-21 <https://doi.org/10.1080/14777620801907913>

490 Simonetta Cheli, “Cooperation in Space,” in *Outer space in society, politics and law*, ed. by Christian Brünner and Alexander Soucek (New York: Springer, 2011), 182.

491 Marcia S. Smith, “President Obama's National Space Policy: A change in tone and a focus on space sustainability,” *Space Policy* 27, no. 1 (2011): 20-23, <http://dx.doi.org/10.1080/14777620903372982>.

492 Gérard Brachet and Xavier Pasco, “The 2010 US space policy: A view from Europe,” *Space Policy* 27, no. 1 (2011): 11-14, <https://doi.org/10.1016/j.spacepol.2010.12.013>.

concludes that “space is vital to U.S. national security and our ability to understand emerging threats, project power globally, conduct operations, support diplomatic efforts, and enable global economic viability”⁴⁹³. Meanwhile, the Wolf Amendment kept the US from spending “any federal funds on participating, collaborating or coordinating in bilateral cooperation with China”⁴⁹⁴. In 2011, Obama and Hu Jintao made a joint statement on improving US-Sino space cooperation, but the initiative never materialized.⁴⁹⁵

In recent years, under the Trump administration, the US has focused on new satellites, dual-use ABM systems, the creation of a US Space Force, renewed space exploration, and a new space plane. The Ground Based Interceptor (GBI) has been demonstrated to the world as an “effective ASAT system for destroying satellites at up to 1,500 kilometres altitude”⁴⁹⁶. The same is true for the ship-based Aegis-system based on the Standard Missile 3 (SM-3) interceptors.⁴⁹⁷ In recent years, the X-37B robotic spaceplane has been developed as an unmanned miniature version of the Space Shuttle that can stay in orbit for longer periods of time.⁴⁹⁸ The space plane could potentially be used for either peaceful or offensive military purposes. Several private companies have developed their own SLVs by means of large government contracts. Most notably, SpaceX has developed and successfully operated the Falcon 9 reusable commercial SLV.⁴⁹⁹ Recently, the Trump administration has revived the advisory National Space Council⁵⁰⁰, moved toward the creation of a space force^{501,502}, developed major projects like the Space Launch System (SLS) and the Orion capsule⁵⁰³, and revived the US human spaceflight program to return to the Moon and send the first humans to Mars.⁵⁰⁴

493 “National Security Space Strategy (Unclassified Summary),” United States Department of Defense and the Office of the Director of National Intelligence, accessed April 27, 2019, <https://www.hsdl.org/?view&did=10828>.

494 Johnson-Freese, *Space Warfare in the 21st century*, 84.

495 Ibid.

496 Hays, *Space and Security*, 73.

497 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, 39.

498 Johnson-Freese, *Space Warfare in the 21st century*, 95.

499 Leu, “Watch SpaceX launch its first truly reusable rocket.”

500 The White House, “President Donald J. Trump is Reforming and Modernizing American Commercial Space Policy,” May 24, 2018, <https://history.nasa.gov/TrumpSPD-2.htm>.

501 The White House, “President Donald J. Trump is Establishing America’s Space Force,” February 19, 2019, <https://www.whitehouse.gov/briefings-statements/president-trump-establishing-americas-space-force/>

502 Cooper, “Pence Advances Plan to Create A Space Force.” May 24, 2018

503 Alexander Bowe, “China’s Pursuit of Space Power Status and Implications for the United States, *U.S.-China Economic and Security Review Commission*, April 11, 2019, https://www.uscc.gov/sites/default/files/Research/USCC_China%27s%20Space%20Power%20Goals.pdf.

504 Ibid.

2.2 The USSR and Russia in Space

The second subchapter of Chapter II presents a contextualised, descriptive international political history of the USSR/Russia during the First and Second Space Age. Russia is ranked among the great space powers (*See Figure 1*) for having reached space milestones like the first satellite, first dog in space, first human, first object to the Moon, first two-man spaceflight, first woman in space, first space walk, and the first space station. Russia currently has 152 operating satellites in orbit (*See Figure 7*)⁵⁰⁵ and, some argue, “the most complete launch program in the world”⁵⁰⁶. Russian SLVs include the Rockot, Soyuz, Zenit, and Proton⁵⁰⁷, and the fifth super-heavy-lift Angara.⁵⁰⁸ Russia uses two main space ports at Baikonur, the world’s largest space launch facility⁵⁰⁹⁵¹⁰, and Plesetsk, and is now constructing a third in Vostochny which is expected ready by 2020.⁵¹¹ Russia also leases one spaceport from Kazakhstan.⁵¹² Over the past two decades, Russia has become one of the leaders in the global commercial launch market, and it is currently one of two states, next to China, that can launch humans to space – and thus the sole provider of human transportation to the ISS.⁵¹³ The Russian GNSS is called Global Navigation Satellite System (GLONASS).⁵¹⁴

According to the Secure World Foundation’s latest open source assessment of counterspace capabilities⁵¹⁵, Russia has been testing co-orbital ASAT technology through the Cosmos satellites series, with links back to the Cold War Istrebitel Sputnikov (IS) system, since 2010. Russia is almost certainly capable of limited direct-ascent ASAT attacks in LEO through systems like Nudol, Kontakt and S-500, but does not currently field operational weapons. Furthermore, large investments have been made into integrating electronic warfare into military operations through tactical system that can jam targets – at least within a local area, but has no publicly known capability to interfere with the US GPS system. Finally, Russia is developing directed energy weapons, like lasers, from its strong knowledge base in this field.

505 “UCS Satellite Database.”

506 Giannopapa, “Space Security Programs Worldwide: An Introduction,” 720-721.

507 Ibid.

508 Kuznetsov, “Space Security Programs Worldwide: An Introduction,” 777.

509 Ibid.

510 More than 2,500 launch vehicles and ICBM have been launched since the cosmodrome has been created.

511 Giannopapa, *Space Security Programs Worldwide*, p. 720-721.

512 United States Defense Intelligence Agency, *Challenges to Security in Space* (Washington, D.C.: Defense Intelligence Agency, 2019), 26.

513 Kuznetsov, “Space Security Programs Worldwide: An Introduction,” 777.

514 Bolton, “Neo-realism and the Galileo and GPS negotiations,” 192.

515 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*.

2.2.1 Historical Context

The Russian space program can be traced back to 19th century rocket scientists like Tsiolkovskiy.⁵¹⁶ In the 1930s, the Soviet government centralized various decade-old rocket teams in the GIRD group to tie rocket science to the military establishment, before imprisoning and killing many leading scientists during the Stalinist purges.⁵¹⁷ When Nazi Germany invaded in 1941, surviving rocket scientists were forced to produce wing-borne rockets and ballistic missiles for the war effort.⁵¹⁸ In the last leg of the war, the USSR captured many low-ranking German engineers and gathered intelligence on V-2 production, but the effort was hindered by the US through Operation Paperclip, British bombing and internal competition.⁵¹⁹

In the years after 1953, when the first Soviet hydrogen bomb was tested and Stalin died, Soviet rocket scientists worked under the Ministry of Medium Machine Building on mid-range rockets able to deliver nuclear bombs over greater distances, as well as a satellite side-project.⁵²⁰⁵²¹ Khrushchev, an ambitious risk-taker and fan of science, gave the scientists more influence over the agenda.⁵²² The NII-88 Institute, lead by Korolev, got easier access to government and military officials as the rocket-friendly Ryabikov rose to leadership over the Military Industrial Commission (VPK). The R-7 ICBM project was decreed and given state importance in 1954 and grew to become the biggest ever Soviet military research project after the nuclear bomb, involving over 200 institutes and 25 ministries.⁵²³ In 1955, building commenced on the Baikonur Cosmodrome long-range launch facility in Kazakhstan.⁵²⁴ Meanwhile, the USSR helped China with missile technology transfers and technical support.⁵²⁵ Following the US IGY press conference in 1955, the USSR announced its own press conference and official decree to launch a IGY satellite.⁵²⁶ By the summer of 1957, the R-7 rocket, which included the world's first guidance system, inflight-steering and vertical launch pad, was ready for testing.⁵²⁷ After two dramatic launch failures in May and June, the R-7 flew 6.500 kilometres on August 21, 1957.⁵²⁸ An official communiqué in Soviet media

516 James C. Moltz, "Russia and China: Strategic Choices in Space," in *Space and Defense Policy*, ed. Damon Coletta and Frances Pilch (Hoboken: Taylor and Francis, 2013), 270.

517 Ibid.

518 Ibid.

519 Sheehan, *The International Politics of Space*, 25.

520 Asif A. Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974* (Washington, D.C.: NASA History Division, Office of Policy and Plans, 2000), 119, 139.

521 Geir Lundestad, *East, West, North, South: International Relations since 1945* (Oslo: Universitetsforlaget, 2010), 151.

522 Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*, 119.

523 Ibid, 120-133.

524 Ibid, 135.

525 Harding, *Space Policy in Developing Countries*, 83-84.

526 Siddiqi, *Challenge to Apollo*, 146-149.

527 Ibid, 130-132, 165.

528 Ibid, 158-160.

proclaimed that the test proved the “possibility of launching missiles into any region of the terrestrial globe”⁵²⁹.

2.2.2 The USSR in the First Space Age

On October 4, 1957, the USSR successfully launched the world’s first artificial satellite, Sputnik I, into orbit using a R-7 rocket.⁵³⁰ Sputnik’s radio transmitter emitted a beep that was clearly detectable in Europe and the US.⁵³¹ One month later, the five times larger Sputnik II carried a dog named Laika into orbit.⁵³² The Soviet satellites would not have been given priority without an intense lobbying campaign from Korolev in the late 1950s. Khrushchev, however, took full advantage of the successful launches conducted on the fiftieth anniversary of the Russian Revolution.⁵³³ He said Sputnik had been launched to convince “the people of Russia, China, India as well as Europe that our system is the best”⁵³⁴. According to opinion polls, most Italians, French and British at the time thought the USSR was leading the US in science.⁵³⁵ Publicly, Khrushchev gave the impression of a “missile gap”, but in reality the R-7 was only being produced in small numbers.⁵³⁶ The Sputniks helped give Khrushchev the confidence necessary to build the Berlin Wall and place nuclear missiles on Cuba.⁵³⁷

After the two Sputnik launches, the USSR kept reaching new milestones in space before the US. In 1958, the first spacecraft was launched towards the Moon, and during the following year Sputnik 5 returned dogs safely from orbit, while Luna 2 crash-landed on the Moon and Luna 3 produced the first photographs of the far side of the Moon.⁵³⁸⁵³⁹ In April 1961, Gagarin achieved manned spaceflight for the first time in history.⁵⁴⁰ In August 1961, a second manned flight deliberately took focus away from the Berlin Crisis.⁵⁴¹ In 1962, Vostok 3 and 4 achieved the first rendezvous in space, and in June 1963, Tereshkova, the first woman in space, spent more time in orbit than all US astronauts combined.⁵⁴² The successive space “firsts” were yet again used as evidence for the superiority of the communist system. New discoveries from the Luna 3

⁵²⁹ Ibid, 161.

⁵³⁰ Ibid, 167.

⁵³¹ Sheehan, *The International Politics of Space*, 26.

⁵³² Ibid, 28.

⁵³³ Ibid, 25-26.

⁵³⁴ Ibid, 22.

⁵³⁵ Ibid, 28.

⁵³⁶ Ibid, 27-28.

⁵³⁷ James G. Hershberg, “The Crisis Years, 1958-1963,” in *Reviewing the Cold War: Approaches, Interpretations, Theory*, ed. Odd Arne Westad (London: Frank Cass, 2000), 308.

⁵³⁸ Sheehan, *The International Politics of Space*, 30.

⁵³⁹ Harding, *Space Policy in Developing Countries*, 58.

⁵⁴⁰ Hays, *Space and Security*, 19.

⁵⁴¹ Sheehan, *The International Politics of Space*, 31.

⁵⁴² Ibid, 30.

photographs were given names like “Mount Lenin” and “Sea of Moscow”.⁵⁴³ Gagarin credited the Communist Party for his success, received the Order of Lenin, had a victory parade in the Red Square, the first televised by western media, and went on a world tour, while Popovich, a cosmonaut launched in 1962, said he was “blazing a trail for all mankind to the communist future”⁵⁴⁴. The USSR ignored Kennedy’s proposed joint lunar mission in 1963.⁵⁴⁵

In the early 1960s, the accelerating US space effort led to a new emphasis on ASAT weapons and military space in the USSR, but funding was running below what the design bureaux requested to compete – in spite of counting approximately US\$ 3.4 billion per year.⁵⁴⁶ The disparate space program, which was plagued by fierce inter-bureau competition and ad hoc decision-making, was mainly seen as a propaganda tool by the leadership, forcing scientists to adapt existing technology instead of focusing on useful scientific gains.⁵⁴⁷ The manned spaceflights between 1961 and 1965 “were often little more than stunts”⁵⁴⁸. The three-man Voshkod spacecraft, for example, was just a slightly modified Vostok meant to fool the US.⁵⁴⁹ Proposed research on a reusable spacecraft was dismissed.⁵⁵⁰ As a direct response to US high-altitude nuclear tests, the Soviets quickly turned to testing high-altitude nuclear explosions and developing space-based tactical systems and conventional ASATs.⁵⁵¹ The USSR, unsuccessful at prohibiting satellite overflight at the UN, launched its own surveillance satellite Cosmos in 1962.⁵⁵² When the two superpowers signed the Limited Test Ban Treaty in 1963, the USSR agreed to ban nuclear ASAT tests.

Under Brezhnev, the USSR invested heavily in military space while signing major space treaties like the OST and the ABMT. In 1963, the anti-space defence establishment Protivo Kosmicheskaya Oborona (PKO) was created.⁵⁵³ The USSR developed and tested the Fractional Orbital Bombardment System (FOBS), ground-based lasers, directed-energy weapons and a co-orbital satellite-killing vehicles guided by radar and infrared sensors.⁵⁵⁴⁵⁵⁵ Work began on the manned military space station Almaz in response to the US MOL project.⁵⁵⁶ More importantly, the

543 Ibid.

544 Ibid.

545 Ibid, 34.

546 Ibid, 33.

547 Ibid.

548 Ibid, 30

549 Ibid.

550 Ibid, 29.

551 Harding, *Space Policy in Developing Countries*, 64-65.

552 Ibid.

553 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 144.

554 Ibid.

555 Alexei Arbatov, “Russian Perspectives on Spacepower,” in *Toward a Theory of Space Power: Selected Essays*, ed. by Charles D. Lutes and Peter L. Hays with Vincent A. Manzo. Lisa M. Yambrik, and M. Elaine Bunn (Washington, D.C.: Institute for National Strategic Studies - National Defense University, 2011).

556 Harding., *Space Policy in Developing Countries*, 54.

Istrebittel Sputnikov or Satellite Destroyer co-orbital ASAT, which was conceived already in the 1950s⁵⁵⁷ and could be launched from an ICBM and overtake and destroy satellites in LEO without contravening the newly signed OST⁵⁵⁸, was tested for the first time in 1963, paving the way for an conventional ASAT test scheme which would last well into the early 1980s.⁵⁵⁹ A new military strategy outlined that space could be used for space weapon systems for combat effectiveness, to prevent other countries from utilizing space and to develop strategic offensive systems able to conduct battle in space.⁵⁶⁰

In the 1970s, the USSR continued to exceed the US in co-orbital ASATs and long-duration manned missions, but lagged behind in communications, early warning, and military reconnaissance satellites. After the first US moon landing, the USSR denied that a manned lunar landing was ever a Soviet goal and instead began developing manned space stations.⁵⁶¹ Satellite capabilities were expanded to support tactical and strategic military operations.⁵⁶² Extensive ASAT testing continued well into the early 1970s.⁵⁶³ In 1972, SALT I and ABMT affirmed US-Soviet parity in strategic nuclear weapons and highlighted that using ASATs could be destabilizing to international politics.⁵⁶⁴⁵⁶⁵ In 1975, the USSR docked with the US in space during the symbolic Apollo-Soyuz mission.⁵⁶⁶ By the following year, the Soviets had begun a new series of co-orbital ASAT tests that lasted until June 1982.⁵⁶⁷ In 1979, improving Soviet force-enhancing military space systems prompted new ASAT talks with the US.⁵⁶⁸ Parallel to the negotiations, several potential ASATs were deployed at the Baikonur spaceport.⁵⁶⁹ In the late 1970s, the first Soviet early-warning system was deployed using a small constellation of Cosmos satellites in highly elliptical orbits.⁵⁷⁰

In the 1980s, the USSR launched a manned space station, navigation system and space shuttle, unilaterally halted ASAT tests, and forged a new space alliance with China after grave financial troubles had left the space programme underfunded. In the early 1980s, the construction of

557 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, 22.

558 Chun, "Viewpoint: Expanding the High Frontier: Space Weapons in History", 68. Istrebittel Sputnikov is sometimes translated in the West as "Satellite killer" or "Satellite destroyer".

559 Moltz, *Russia and China*, p. 274.

560 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 133.

561 Sheehan, *The International Politics of Space*, 32-35.

562 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 144.

563 Chun, "Viewpoint: Expanding the High Frontier: Space Weapons in History," 67.

564 Sheehan, *The International Politics of Space*, 34-35.

565 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 144.

566 Weeden, "U.S.-China Cooperation in Space: Constraints, Possibilities, and Options," 118.

567 Hays, *Space and Security*, 30.

568 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 144.

569 Hays, *Space and Security*, 81.

570 Moltz, "Russia and China: Strategic Choices in Space," 275.

the space station Salyut 7 reaffirmed Soviet supremacy in human spaceflight.⁵⁷¹ As mentioned above, conventional ASAT testing continued up until 1982.⁵⁷² That year, the USSR launched GLONASS to compete with the US GPS.⁵⁷³ When the US developed their MHV ASAT weapon, Andropov proposed a bilateral moratorium on ASAT testing which was turned down by Reagan.⁵⁷⁴ In August 1983, after the US launched the SDI program, the USSR unilaterally stopped all ASAT testing.⁵⁷⁵ The SDI was deemed a critical threat to the effectiveness of Soviet nuclear weapons, but the USSR did not dare challenge the US directly because it would most likely reveal its struggling economy and technological limitations.⁵⁷⁶ Instead, the USSR promoted discussion on PAROS at the CD and proposed several draft treaties on space arms-control.⁵⁷⁷ However, a 1984 Soviet Military Space Doctrine reveals that military superiority in space remained a priority.⁵⁷⁸ In 1986, the Soviet space station was launched under the new name Mir – the Russian word for peace – to highlight the military nature of the SDI program.⁵⁷⁹ In 1988, the unmanned space shuttle Buran, a direct response to the US STS, SDI, and Space Station Freedom programs, was successfully tested.⁵⁸⁰ In 1989, GLONASS reached initial operational capabilities with an accuracy of about 10 meters.^{581,582} However, serious financial problems in the late 1980s led to reduced funding for maintenance, operations and new spacecraft.⁵⁸³ In 1989, Gorbachev re-approached China with an offer to sell Soviet technological experience.⁵⁸⁴

2.2.3 Russia in the Second Space Age

The breakup of the USSR in 1991 led to a “virtual collapse of Soviet spacepower”⁵⁸⁵. Russia lost control of its main space port at Baikonur in Kazakhstan, for which it now had to pay to use, and parts of its extensive network of ground control facilities, receiving stations and tracking facilities in Ukraine, Kazakhstan and Uzbekistan.⁵⁸⁶ The Russian economy was devastated by political instability, ethnic conflicts and the rapid transition to market economy.⁵⁸⁷ A sharp fall in GDP

⁵⁷¹ Ibid, 271.

⁵⁷² Ibid, 274.

⁵⁷³ Christophe Venet, “Space Security in Russia,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 364.

⁵⁷⁴ Ibid, 366.

⁵⁷⁵ Chun, “Viewpoint: Expanding the High Frontier: Space Weapons in History,” 68.

⁵⁷⁶ Sheehan, *The International Politics of Space*, 66.

⁵⁷⁷ Venet, “Space Security in Russia,” 366-367.

⁵⁷⁸ Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 144.

⁵⁷⁹ Sheehan, *The International Politics of Space*, 102.

⁵⁸⁰ Moltz, “Russia and China: Strategic Choices in Space,” 271.

⁵⁸¹ Venet, “Space Security in Russia,” 364.

⁵⁸² Moltz, “Russia and China: Strategic Choices in Space,” 275-276.

⁵⁸³ Ibid, 271-272.

⁵⁸⁴ Ibid, 279.

⁵⁸⁵ Arbatov, “Russian perspectives on Spacepower.”

⁵⁸⁶ Venet, “Space Security in Russia,” 362.

⁵⁸⁷ Arbatov, “Russian perspectives on Spacepower.”

between 1991 and 1996 followed by the financial crisis of 1998 was reflected in space and defence budgets.⁵⁸⁸ Military launches dropped from 31 in 1992 to only four in 1999.⁵⁸⁹ Russian combat aircraft and vessels had to rely on US and Canadian satellites, and long-term R&D in military space was neglected.⁵⁹⁰ Insufficient funding caused gaps in the GLONASS and early-warning satellite systems, which required several maintenance launches per year, while the Mir space station was left empty until it was shut down and de-orbited in 2001.⁵⁹¹

To counter the space power collapse, Russia under president Yeltsin commercialized SLVs and reorganized the military space sector. Between 1995 and 2011, Russian commercial launches accounted for about 40 per cent of the global space launch market.⁵⁹² The Soviet space program was a conglomerate of state-controlled design and production facilities, so the Russian space industry remained strictly compartmentalized from the rest of the civil economy.⁵⁹³ Converted ICBMs were sold to Western countries as commercial SLVs to generate income during the crisis.⁵⁹⁴ In a similar fashion, leading private space companies like Khrunichev and Energomash began making commercial products for Western companies like Boeing and Lockheed Martin, while others made deals with states like Iraq, Syria and India.⁵⁹⁵ Russia partially opened a door to China, which became a small-scale space partner in this period.⁵⁹⁶ In 1992, the Russian Military Space Forces (VKS) were created, based on the Soviet military architecture, and set to operate the launch centre at Baikonur, on which Russia signed a long-term contract with Kazakhstan.⁵⁹⁷ Simultaneously, the civilian Russian Space Agency (now *Roscosmos*) was established.⁵⁹⁸ Russia invested heavily, both financially and politically, in joining the ISS, but Russian contributions were often delayed.⁵⁹⁹ In 1997, the VKS merged with the strategic missile forces, space forces and ABM forces to become the VRKO. In the late 1990s, Russia joined with China and others at UN to work for a ban on weapons in space through the PAROS initiative.⁶⁰⁰

In the early 2000s, with president Putin in power, Russia launched several ambitious initiatives to strengthen its military and commercial space capabilities. The Russian Space Agency no longer faced imminent bankruptcy, and military space, human spaceflight and science received

588 Venet, "Space Security in Russia," 357.

589 Moltz, "Russia and China: Strategic Choices in Space," 275.

590 Venet, *Space Security in Russia*, 357-348

591 Moltz, "Russia and China: Strategic Choices in Space," 272.

592 Kuznetsov, "Russian Space Launch Programs," 777.

593 James E. Oberg, *Space Power Theory* (Colorado Springs: US Air Force Academy, 1999), 51.

594 Arbatov, "Russian perspectives on Spacepower."

595 Moltz, "Russia and China: Strategic Choices in Space," 272-273.

596 Venet, "Space Security in Russia," 360.

597 Moltz, "Russia and China: Strategic Choices in Space," 273.

598 Ibid.

599 Oberg, *Space Power Theory*, 59.

600 Moltz, "Russia and China: Strategic Choices in Space," 276.

more funding.⁶⁰¹ In 2001, the Space Forces (KV) were created to consolidate military space and operate military spaceports, ground control centres, ground radar sites and the A-135 ABM system protecting Moscow.⁶⁰² In 2002, after the US pulled out of the ABMT, Russia submitted a UN draft treaty meant to ban weapons in space, followed by a non-paper on the issue.⁶⁰³ In 2003, Putin announced at the UN that Russia had adopted a “no-first deployment” policy on offensive space weapons.⁶⁰⁴ Meanwhile, the A-135 system was expanded and modernized.⁶⁰⁵ After the 2003 US Columbia disaster, Russia replaced planned US shuttle missions.⁶⁰⁶ Three major space policy documents were issued in this period to enhance the space industry's global competitiveness, improve GLONASS and develop the country's space ports.⁶⁰⁷ In 2004, GLONASS satellite launches resumed⁶⁰⁸, just as Russia and Kazakhstan agreed on a new long-term lease on Baikonur lasting until 2050.⁶⁰⁹ During the Second Chechen War, Russia disrupted satellite and phone communications between Chechen rebels and Iran.⁶¹⁰ However, Russia could not shake all of the negative effects of the 1990s. In comparison, the US space budget in 2004 was still 20 times larger than that of Russia.⁶¹¹

In the second half of the 2000s, the Russian state took more control over the space sector with semi-successful results. Backed up by several new space policy documents, the Russian government heavily intervened in the space and defence industries, reoriented their production towards the national armed forces and subordinated them to the newly created Military-Industrial Commission (VPK) in 2006.⁶¹² These trends were accompanied by a steady and sharp increase in the Russian space budget, even during the 2008 financial crisis.⁶¹³ However, Russia's space budget remained relatively low in comparison to the biggest spenders, with one estimation placing it around \$1 billion in 2007.⁶¹⁴ In 2006–2007, bold plans for the Svobodny space port in the far east was abandoned.⁶¹⁵ The 2008 war with Georgia highlighted obvious weaknesses in Russia's command and control system. Satellite targeting, for example, could not be used because

601 Ibid, 273.

602 Venet, “Space Security in Russia,” 360.

603 Ibid, 367.

604 Moltz, “Russia and China: Strategic Choices in Space,” 276.

605 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 147.

606 Moltz, “Russia and China: Strategic Choices in Space,” 273.

607 Venet, “Space Security in Russia,” 358.

608 Ibid, 364.

609 Kuznetsov, “Russian Space Launch Programs,” 777.

610 William Gouveia Jr., “An Assessment of Anti-Satellite Capabilities and their Strategic Implications,” *Astropolitics* 3, no. 2 (2005): 175. <https://doi.org/10.1080/14777620590967208>

611 Venet, “Space Security in Russia,” 357.

612 Ibid, 358-359.

613 Ibid.

614 Ibid, 355.

615 Ibid, 361.

GLONASS was non-operational and GPS was unavailable over Georgia.⁶¹⁶ In the aftermath of the conflict, Russian decision-makers pushed for further modernization in space.⁶¹⁷ In 2008, Russia and China proposed the PPWT draft treaty to ban weapons in space, but the effort was not supported by the US.⁶¹⁸

In the last decade, Russia put enough resources into space capabilities to maintain its positions as the world's second largest space power.⁶¹⁹ Satellites were placed in orbit to update early warning, military communication and reconnaissance systems, and GLONASS is fully operational with 24 satellites in orbit – with China and India as users.⁶²⁰ However, Russia did not respond to all of China's overtures for military space cooperation and excluded joint SLVs and satellites.⁶²¹ Russia still has ten operational ground stations scattered on its territory.⁶²² Existing early warning radars were modernized while a new generation was tested.⁶²³ One electro-optical space monitoring station and one command and control site have been commissioned. New SLVs, like the modular Angara rocket, are under intensive development.⁶²⁴ The once top-secret Plesetsk space and missile launching range is undergoing broad modernization and expansion.⁶²⁵ Once ready, the Angara-Plesetsk combination will, despite the site's location far north of the equator, be able launch military payloads into all operational orbits.⁶²⁶ Russia's Space Forces, unified in one air and space force called the Aerospace Defense Forces (VVKO) in 2011^{627,628}, are refocusing their personnel to sovereign territory.⁶²⁹

However, Russia undoubtedly saw a “lost decade” in space in the 1990s, leaving it lagging far behind the US.⁶³⁰ In terms of current space budget allocations, estimated at somewhat higher than \$1 billion⁶³¹, Russia barely enters in the top five internationally.⁶³² Private funding for cooperative ventures with Western companies, foreign government contracts, and space tourism

616 Ibid, 365.

617 Ibid, 355.

618 Nikita Perflyev, “The Sino-Russian Space Entente,” *Astropolitics* 8, no. 1 (2010): 29, <https://doi.org/10.1080/14777622.2010.494516>.

619 Venet, “Space Security in Russia,” 363.

620 Moltz, “Russia and China: Strategic Choices in Space,” 276.

621 Perflyev, “The Sino-Russian Space Entente,” 20.

622 Venet, “Space Security in Russia,” 362.

623 Arbatov, “Russian perspectives on Spacepower.”

624 Hilborne, “China’s Rise in Space and US Policy Responses: A Collision Course?”

625 Kuznetsov, “Russian Space Launch Programs,” 777-778.

626 Venet, “Space Security in Russia,” 362.

627 Venet, “Space Security in Russia,” 367.

628 The VVKO have four main components: the Russian Space Command, the Air and Missile Defence Command, the Plesetsk Cosmodrome, and the arsenal.

629 Kuznetsov, “Russian Space Launch Programs,” 777-778.

630 Arbatov, “Russian perspectives on Spacepower.”

631 Moltz, “Russia and China: Strategic Choices in Space,” 276.

632 Arbatov, “Russian perspectives on Spacepower.”

now constitute a significant portion of the Russian space industry's overall budget.⁶³³ The early warning system, which was designed only to observe ballistic missile launches from the US, still lacks global detection capabilities.⁶³⁴ Russia is facing difficulties in military earth observation, and military space satellites in general and GLONASS in particular focus on Russian territory and the near abroad.⁶³⁵ Additionally, no ocean surveillance satellite has been launched after 2006.⁶³⁶ In 2015, the space force merged with the Russian air force to become the Russian Aerospace Forces.⁶³⁷ The US currently pays Roscosmos 80 million USD for every american astronaut launched aboard the Soyuz SLV.⁶³⁸ Russia has been jamming GPS signals during both the Ukraine and Syria conflicts.⁶³⁹ However, Russian satellites still have a very short operational lifetime in orbit⁶⁴⁰, and tensions with Kazakhstan over drop zones have led to launch delays.⁶⁴¹ Like the US and China, Russia is currently developing a small dual-use robotic space plane similar to the X-37B.⁶⁴²

2.3 China in Space

The third subchapter in Chapter II presents a contextualised, descriptive international political history of China during the First and Second Space Age. China, which currently fields 284 operating satellites (*See Figure 7*)⁶⁴³, has become “one of the top space powers⁶⁴⁴ in the world after decades of high prioritization and steady investment from its leaders, indigenous research and development, and a significant effort to buy or otherwise appropriate technologies from foreign sources”⁶⁴⁵ (*See Figure 1*). Most Chinese space activity has been either directly or indirectly controlled by the People's Liberation Army (PLA)⁶⁴⁶, but has also established The China National Space Association (CNSA) as a civilian interface with other space agencies, the China Aerospace Science and Technology Corporation (CASC) to handle commercial aspects, and 130 other organisations supporting the space program.⁶⁴⁷ China has, with good help from the USSR and

633 Moltz, “Russia and China: Strategic Choices in Space,” 272-273.

634 Venet, “Space Security in Russia,” 363.

635 Ibid.

636 Ibid, 364.

637 Todd Harrison et al., *Space Threat Assessment 2019* (Washington, D.C.: Center for Strategic and International Studies, 2019), 19.

638 Ibid, 23.

639 Venet, “Space Security in Russia,” 364.

640 Ibid.

641 Ibid, 361.

642 Hilborne, “China's Rise in Space and US Policy Responses,” 123.

643 “UCS Satellite Database.”

644 China has developed SLVs, ASATs, the GNSS called Beidou, and, most recently, human spaceflight, deep space robotic exploration, and space planes in only a few decades.

645 Oberg, *Space Power Theory*, 272.

646 Ibid, 273.

647 Stacey Solomone, “China's Space Program: The Great Leap Upward,” *Journal of Contemporary China* 15, no. 47

Russia, developed more than 10 SLV models, most of them belonging to the Long March (LM) series.⁶⁴⁸ The LM-3A series have realized more than 50 launches alone. There are four spaceports in China: Jiuquan, Taiyuan, and Xichang and Wenchang.⁶⁴⁹ Beijing has a very active ASAT program and appears to have attempted at least six ASAT tests.⁶⁵⁰

According to the Secure World Foundation's latest open source assessment of counterspace capabilities⁶⁵¹, China has conducted multiple tests of the SJ satellite series that could lead to a co-orbital ASAT. Through several tests, perhaps dating back as far as 2005, China has proved to have between one and three different direct-ascent ASAT programs, which are either dedicated ASAT systems or dual-use ABM systems. These systems can like reach satellites in LEO, but systems that can target satellites in MEO and GEO are still in an experimental or developmental phase.

2.3.1 Historical Context

China is called "the cradle of rockets" because the Song Dynasty invented black powder rocket in the eleventh century.⁶⁵² In 1232, the Chinese invaded the Mongols with flying fire arrows in the first documented use of solid-propellant rockets in war.⁶⁵³ By the late 1500s, Chinese military forces already used an early form of multi-stage rocket.⁶⁵⁴ During the 150 years of humiliation", from 1800 to 1949, China was invaded by Japan and Western powers, for example during the Opium War of 1839 and the loss of Hong Kong to Great Britain.⁶⁵⁵

In the 1920s, Chinese intellectuals identified science and technology as key to re-establishing Chinese superiority.⁶⁵⁶ After WWII, Chinese-born scientists were invited back from the West to develop the space program.⁶⁵⁷ Among those who returned, though involuntarily, was professor Qian Xuesen.⁶⁵⁸ He had been among the founders of the US Army's Jet Propulsion Laboratory (JPL) during WWII, directly involved in debriefing Nazi scientists in Operation Paperclip, and a protégé of Theodore Kármán.⁶⁵⁹ In 1951, at the peak of McCarthy's "red scare",

(2006): 311-327, <https://doi.org/10.1080/10670560500535019>.

648 Giannopapa, "Space Security Programs Worldwide," 271.

649 Lehao Long and Dan Li, "The Chinese Space Launch Program," in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 869.

650 Michael Krepon and Sonya Schoenberger, "Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013," in *Anti-satellite Weapons, Deterrence and Sino-American Space Relations*, ed. Michael Krepon and Julia Thompson (Washington D.C.: Stimson Center, 2013), 131.

651 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*.

652 Long and Li, "The Chinese Space Launch Program," 868.

653 Harding, *Space Policy in Developing Countries*, 81-82.

654 Ibid.

655 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 140.

656 Ibid.

657 Moltz, "Russia and China: Strategic Choices in Space," 277.

Qian was accused of being a communist and placed in house arrest for five years.⁶⁵⁸ A diplomatic row between the US and China followed, lasting until Qian was exchanged with US prisoners from the Korean war.⁶⁵⁹ Once in China, Qian became essential to the Chinese missile program, doing work on ICBMs, the Long March SLV family, and the Silkworm cruise missile.⁶⁶⁰ He also helped establish the classified Fifth Research Academy of the Ministry of National Defence in 1955 – the year China declared its intention to develop a nuclear weapon.⁶⁶¹

2.3.2 China in the First Space Age

China's modern space program was born in the late 1950s.⁶⁶² A small space program was set up under PLA control in 1956.⁶⁶³ Having witnessed the prestige effects of the Sputniks and dual use nature of SLVs, chairman Mao pushed forward on missile and space launch technology in pursuit of great power status.⁶⁶⁴ But China was far poorer than the US or the USSR⁶⁶⁵ and relied on Soviet technical support, technology transfers and education.⁶⁶⁶ The USSR helped China build its first missile, the DF-1, and set up the classified Missile and Rocket Research Institution, and provided plans and R-2 rockets under the New Defence Technical Accord of 1957.⁶⁶⁷ At the Eighth Congress of the CCP in 1958, Mao announced his intention to build the first Chinese satellite, and so the Chinese Academy of Science tasked Group 581 with launching one on top of a sounding rocket.⁶⁶⁸

Chinas's space program remained a "weak and under-funded effort that suffered tremendous hardships during the 1960s"⁶⁶⁹. In the midst of domestic political turmoil caused by the Great Leap Forward⁶⁷⁰, an ideological split with the USSR brought technical assistance and technology transfers to a halt.⁶⁷¹ In 1960, as China launched its first liquid-fuelled rocket using a bicycle pump to pressurize the fuel tank, Soviet specialists were ordered home.⁶⁷² Thus, China had to assume full ownership of its own space program. In the mid-1960s, shortly after the Cuba Missile Crisis,

658 Harding, *Space Policy in Developing Countries*, 83-84.

659 Ibid.

660 Hou, Shenyuan and Hao Liu, "Chinese Satellite Programs: An Internal View," in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 886.

661 Harding, *Space Policy in Developing Countries*, 83-84.

662 Hou and Liu, "Chinese Satellite Programs," 886.

663 Anantamula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 140.

664 Harding, *Space Policy in Developing Countries*, 83-84.

665 Shu-Hsien, "Will China become a military space superpower?," 206.

666 Perilyev, "The Sino-Russian Space Entente," 20-21.

667 Harding, *Space Policy in Developing Countries*, 83-85.

668 Ibid.

669 Moltz, "Russia and China: Strategic Choices in Space," 277.

670 Harding, *Space Policy in Developing Countries*, 85.

671 Perilyev, "The Sino-Russian Space Entente," 21.

672 Harding, *Space Policy in Developing Countries*, 85.

China tested a nuclear weapon and an IRBM capable of carrying a nuclear warhead.⁶⁷³ In 1965, the space program's institutional framework was decided.⁶⁷⁴ Satellites and manned spaceflight became the next primary objectives.⁶⁷⁵ In 1966, the first Chinese human spaceflight program was started.⁶⁷⁶ With an imminent US moon landing as a backdrop, Mao founded the Chinese Academy for Space Technology in 1968.⁶⁷⁷ However, in 1969, a Sino-Soviet border conflict brought the relationship to a new low.⁶⁷⁸

One year later, in 1970, China's LM-1 rocket successfully launched the Dongfanghong-1 (DH-1) satellite into low Earth orbit⁶⁷⁹ – playing the patriotic song “The East is Red”⁶⁸⁰. That made China the fifth country in the world to launch a satellite independently.⁶⁸¹⁶⁸² The Chinese Air Force started selecting pilots for human spaceflight training, sometimes using cardboard and wooden spacecraft mockups⁶⁸³, and even scheduled a test flight for 1973.⁶⁸⁴ But as the US and USSR signed SALT I and ABMT, Mao cancelled the human spaceflight program in 1972 due to financial pressure, scientific problems and political opposition.⁶⁸⁵ However, in 1975, China successfully launched and recovered a remote-sensing satellite for the first time.⁶⁸⁶

After Mao's death in 1976, China under Deng tried to recover from the Cultural Revolution by reengaging with the international community and prioritizing civilian and commercial space over military space. The Cultural Revolution destroyed much of the Chinese economy, but spared most of the space science community.⁶⁸⁷ As “technology and Western military concepts had begun to displace politics and ideology as the underpinnings of China's military policy”⁶⁸⁸, the entire defence sector, including the space program, was scaled back and reoriented to make commercial products.⁶⁸⁹ The Great Wall Industry Corporation (GWIC), founded in 1980, would play a central role in the commercial effort by selling launch and satellite services and technology on the global market outside the firm grip of the PLA.⁶⁹⁰ The GWIC conducted 29 commercial launch missions

673 Ibid.

674 Ibid, 86.

675 Shu-Hsien, “Will China become a military space superpower?,” 206.

676 Perfilyev, “The Sino-Russian Space Entente,” 21.

677 Harding, *Space Policy in Developing Countries*, 86.

678 Perfilyev, “The Sino-Russian Space Entente,” 21.

679 Long and Li, “The Chinese Space Launch Program,” 869.

680 Harding, *Space Policy in Developing Countries*, p. 86.

681 Long and Li, “The Chinese Space Launch Program,” 869.

682 The satellite launch did benefit from German electronics and French technical assistance.

683 Harding, *Space Policy in Developing Countries*, 86.

684 Perfilyev, “The Sino-Russian Space Entente,” 21.

685 Ibid.

686 Hou and Liu, “Chinese Satellite Programs,” 886.

687 Harding, “Space Policy in Developing Countries,” 86.

688 John W. Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernisation in the Nuclear Age* (Stanford: Stanford University Press, 1994), 165.

689 Harding, *Space Policy in Developing Countries*, 87-88.

690 Ibid.

for 35 satellites from 1987 to 2009 and established business relationships with more than 100 companies and organizations throughout the world.⁶⁹¹ In 1982, at a space conference in Switzerland, China officially declared its entrance into the commercial satellite market.⁶⁹² China even tried to buy a US communications satellite, but the deal fell through.⁶⁹³ In 1983, China signed the OST, and kept on seeking adhesion to space-related multilateral agreements.⁶⁹⁴ In 1984, China launched the first communications satellite into GEO aboard a LM-3 rocket from the new Xichang space port.⁶⁹⁵⁶⁹⁶ In the years after, China delivered commercial launch services to Hong Kong, Saudi Arabia, Sweden, and Australia, before going after markets in Asia, Africa, and South America.⁶⁹⁷ New satellites for remote sensing, meteorology, and military uses followed.⁶⁹⁸ Still, the Chinese military reconnaissance and surveillance capabilities of the 1970s and 1980s were far inferior to those of the USA and the USSR.⁶⁹⁹ Programs devoted to signals intelligence (SIGINT) space capabilities, for example, were scrapped.⁷⁰⁰

In the late 1980s, China invested in space R&D and used its growing commercial space power to provide a reliable, cheap SLV alternative to the US and USSR. A series of events in 1986 impacted China's trajectory. First, several Western space accidents in a row: the US Space Shuttle Challenger exploded, two leading US SLVs exploded, and a European Ariane crashed.⁷⁰¹ After the accidents, Deng was advised by leading space and nuclear scientists to urgently invest more in science and technology.⁷⁰² Plan 863 aimed to strengthen high-technology in general and the space industry's competitiveness and R&D in particular.⁷⁰³⁷⁰⁴ Its goal was to “stimulate massive improvements in biotechnology, information technology, lasers, automation, energy, and aerospace”, “position China to concentrate its space program on practical applied satellites”, and “free China from external technology dependencies”.⁷⁰⁵ After president Reagan announced the SDI, China began to modernize its strategic missile forces.⁷⁰⁶ The LM-2 SLV launched satellites for a

691 Ibid.

692 Ibid.

693 Ibid.

694 Ibid.

695 Hou and Liu “Chinese Satellite Programs,” 886.

696 Shu-Hsien, “Will China become a military space superpower?,” 206.

697 Harding, *Space Policy in Developing Countries*, 90.

698 Moltz, “Russia and China: Strategic Choices in Space,” 278-279.

699 Shu-Hsien, “Will China become a military space superpower?,” 209.

700 Ibid, 208.

701 Ibid, 206.

702 Dean Cheng, “Chinese Concepts of Space Security,” in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 433.

703 Shu-Hsien, “Will China become a military space superpower?,” 206.

704 Plan 863 was formally called the National High-Technology Research and Development Plan.

705 Harding, *Space Policy in Developing Countries*, 89.

706 Theresa Hitchens and David Chen, “Forging a Sino-US “Grand Bargain” in Space,” *Space Policy* 24, no. 3, (2008): 129, <https://doi.org/10.1016/j.spacepol.2008.06.008>.

French company and a German consortium in 1978 and 1988.⁷⁰⁷ In 1988, an expert group of 17 Chinese space experts met and debated the future of China's space program.⁷⁰⁸ In the aftermath of the Tiananmen Square incident, Western states imposed an arms embargo on the country.⁷⁰⁹ The USSR on the other hand, in crisis, opened its door to China and contributed to the creation of the Chinese Shenzhou spacecraft based off the Soviet Soyuz module.⁷¹⁰ An indigenous meteorological satellite was produced and launched into polar orbit, making China the third country in the world to do so.⁷¹¹ In 1989, the Chinese Aerospace Corporation was created to unite the country's major space technology facilities.⁷¹²

2.3.3 China in the Second Space Age

The Chinese push into science and technology continued into the Second Space Age, as did space alliance with Russia. The first Chinese five-year plan for 1991 to 1995 put focus on space technology.⁷¹³ In 1990, China launched two atmospheric DQ-1 satellites that had many of the characteristics of a SIGINT satellite.⁷¹⁴ Contacts on the highest official level followed suit.⁷¹⁵ In 1992, Russian President Boris Yeltsin visited China, after a delegation from the Beijing Aerospace University had visited the Russian Mission Control Centre.⁷¹⁶ China and the USSR laid the foundation for revitalised space cooperation when they signed the Intergovernmental Agreement in the Field of Exploration and Use of the Outer Space for Peaceful Purposes.⁷¹⁷ Project 921, authorized in 1992 and later renamed Shenzhou, became China's second attempt at a human spaceflight program⁷¹⁸ – and Russian technology was essential to the project.⁷¹⁹ The CNSA, established in 1993 as a civilian, executive agency for space functions, claimed it to be the largest and most expensive project ever undertaken by China.⁷²⁰ In 1994, China and Russia signed an interagency agreement that facilitated cooperation between the new space agencies Roscosmos and CNSA.⁷²¹

The US military dominance displayed in the Gulf and Kosovo wars was a wake-up-call in

707 Shu-Hsien, "Will China become a military space superpower?," 206.

708 Harding, *Space Policy in Developing Countries*, 91.

709 Perfilyev, "The Sino-Russian Space Entente," 21.

710 Moltz, "Russia and China: Strategic Choices in Space," 279.

711 Harding, *Space Policy in Developing Countries*, 90.

712 Moltz, "Russia and China: Strategic Choices in Space," 279.

713 Shu-Hsien, "Will China become a military space superpower?," 206-207.

714 Ibid, 208.

715 Perfilyev, "The Sino-Russian Space Entente," 21-22.

716 Ibid.

717 Ibid.

718 Harding, *Space Policy in Developing Countries*, 92. In English: Sacred Vessel

719 Perfilyev, "The Sino-Russian Space Entente," 24.

720 Cheng, "Chinese Concepts of Space Security," 438.

721 Perfilyev, "The Sino-Russian Space Entente," 22.

China – and made the PLA conclude that space had become the new strategic high ground.⁷²² China observed that the US was highly dependent on “complex but exposed network of sophisticated command, control, communications and computer-based intelligence, surveillance and reconnaissance systems operating synergistically in and through space”⁷²³. The PLA noted that some 70 US military and commercial satellites were employed, providing 70 per cent of US data transmission capacity and 90 per cent of its strategic intelligence.⁷²⁴ China clearly understood that space forces can provide time-critical data and information related to ballistic missile attacks, world-wide communications, up-to-date weather information, pinpoint navigation and positioning.⁷²⁵ A Chinese military scholar on the country’s calculus wrote that an effective defence strategy would include the development of robust reconnaissance, tracking, and monitoring space systems to also include anti-satellite capabilities and space attack weapon systems.⁷²⁶ In 1993, the PLA produced a new set of “Military Strategic Guidelines for the New Period”, introducing the concept of “local wars under modern, high-tech conditions”⁷²⁷, later updated to “local wars under conditions of informational”⁷²⁸. Joint military operations, especially integrated joint operations, had become dependent on the ability to gather, share, and apply information from air, land, and sea areas but also outer space and cyberspace.⁷²⁹

In the 1990s, China continued to grow its commercial space sector and increase international cooperation, but it was criticized by the US for proliferating dangerous space capabilities. China’s Space Leading Group (SLG) was established in 1991 and has overseen and coordinated all space activities in a broad policy-making role.⁷³⁰ In 1992, Chinese, Pakistani, and Thai officials proposed the creation of an Asian grouping to discuss space matters.⁷³¹ Launch providers continued to compete against counterparts in the US, Europe and Russia.⁷³² China aggressively sought out international space partnerships, and was accused of selling missile technology to Iran, North Korea, and Iraq.⁷³³ The Divestiture Act of 1998 wrested control of these purely commercial activities from the PLA and “reassert[ed] government dominance over what many considered to be an institution rife with corruption and ill-prepared for the demands of the professional military of a

722 Cheng, “Chinese Concepts of Space Security,” 438.

723 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 141.

724 Cheng, “Chinese Concepts of Space Security,” 437.

725 Shu-Hsien, “Will China become a military space superpower?,” 208.

726 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 141.

727 Cheng, “Chinese Concepts of Space Security,” 437.

728 Hays, *Space and Security*, 95.

729 Cheng, “Chinese Concepts of Space Security,” 436-437.

730 Shu-Hsien, “Will China become a military space superpower?,” 206-207.

731 Harding, *Space Policy in Developing Countries*, 95.

732 Cheng, “Chinese Concepts of Space Security,” 434.

733 Harding, *Space Policy in Developing Countries*, 89, 95.

hegemonic state”⁷³⁴.

In transition to the new millennium, China developed a space-based navigation system, a successful launch service, published a space white paper, and became a member of the exclusive human spaceflight club with the US and Russia. The autonomous Beidou Navigation System (BNS) was fielded, together with the Qu Dian C4I system, as well as new reconnaissance capabilities and dual-use technologies. These capabilities were officially intended for territorial survey, disaster monitoring, and space science, but also provided the PLA with five meters targeting accuracy.⁷³⁵ In 1999, a LM-2F successfully launched the first experimental Shenzhou spacecraft on China's 50th anniversary.⁷³⁶⁷³⁷ In 2000, China issued the first of many white papers on space activities.⁷³⁸ The 2000 white paper was the first to introduce China's space achievements, strategy, and policies systematically and outline its space program's primary goals as space exploration, space applications, and economic development.⁷³⁹ By October that year, China had launched over 100 of its own satellites, with a success rate of over 90 percent.⁷⁴⁰ In the following years, four additional unmanned spacecraft missions showed an increasing level of complexity.⁷⁴¹ The 2001 Shenzhou II flight carried a monkey, a dog, a rabbit, and snails into space for seven days.⁷⁴² In October 2003, China's first independent manned space mission was a success when the Shenzhou V launched “taikonaut” Yang Liwei into space.⁷⁴³

The early 2000s brought a wave of space cooperation to Beijing, but the bilateral relationship to the US in space sank to a new low. Already in 1999, the joint venture China-Brazil Earth Resource Satellite (CBERS) was launched.⁷⁴⁴ The program gave China “multi-sensor payload and digital transmission capabilities with considerable sophistication”⁷⁴⁵, but did not provide high-resolution imagery immediately.⁷⁴⁶ Annual prime minister meetings with Russia on space was set up in 2000, and the first of three multi-year agreements was agreed to a year later.⁷⁴⁷ Cooperation with the ESA and European countries “blossomed”.⁷⁴⁸ In 2003, Brussels and Beijing signed the “Sino-

734 Ibid.

735 Ibid, 97.

736 Ibid, 92.

737 The Shenzhou was based on the Soviet Soyuz spacecraft, but was 13 percent larger and had four separate engines instead of two.

738 Mu and Fan, “An Overview of Chinese Space Policy,” 422-423.

739 Ibid.

740 Harding, *Space Policy in Developing Countries*, 93.

741 Perfilyev, “The Sino-Russian Space Entente,” 24.

742 Harding, *Space Policy in Developing Countries*, 92.

743 Hays, *Space and Security*, 93.

744 Hou and Liu, “Chinese Satellite Programs: An Internal View,” 887.

745 Shu-Hsien, “Will China become a military space superpower?,” 209.

746 Ibid.

747 Perfilyev, “The Sino-Russian Space Entente,” 25.

748 Harding, *Space Policy in Developing Countries*, 91.

European *Galileo* Plan Technology Cooperation Agreement”, to which China contributed US\$ 265 million.⁷⁴⁹ In November 2005, the Asia-Pacific Space Cooperation Organization (APSCO) was established.⁷⁵⁰ In 2006 and 2007, China gave several countries new receiving stations.⁷⁵¹ After a 1995 commercial launch failure created a backlash in US-Sino space cooperation, the Cox Commission Report, issued by the US Congress in 1999, asserted that Loral Space and Communications and Hughes Electronics damaged US national security by transferring sensitive space technology to China when they assisted with the investigation of two Chinese rocket explosions that destroyed their satellite.⁷⁵²⁷⁵³ The US tightened its technology export control regime on dual-use space technology and transferred licensing authority to the US State Department.⁷⁵⁴ In January 2003, two days after the launch of the Shenzhou IV, Hughes and Boeing were accused of passing sensitive space and missile technology to China.⁷⁵⁵

After the US unilaterally withdrew from the ABMT in 2002, China responded by trying to change the international space regime while testing ASAT weapons. China, Russia and five other countries introduced a PAROS working paper aimed at preventing the deployment of weapons in outer space to the CD, followed by two non-papers on space two years later.⁷⁵⁶⁷⁵⁷ In 2006, China presented yet another, revised round of hypotheses on PAROS.⁷⁵⁸ A new space white paper opposed the weaponisation of space.⁷⁵⁹ And a new five-year plan for space development was implemented.⁷⁶⁰ Furthermore, China initiated space cooperation with countries like Nigeria, Venezuela and Bolivia.⁷⁶¹ Parallel to diplomatic efforts, China tested ASAT-weapons – which dated back to the period between the 1960s and the 1990s – on several occasions.⁷⁶² First, China blinded a US satellite with a laser in 2006.⁷⁶³ More importantly, in 2007, China tested a ground-based ASAT for the first time.⁷⁶⁴ After failed attempts in 2005 and 2006, an IRBM was launched from the ground to target and destroy a Chinese weather satellite in space.⁷⁶⁵ The event produced one of the largest

749 Johnson-Freese and Erickson, “The Emerging China–EU Space Partnership,” 18.

750 Cheng, “Chinese Concepts of Space Security,” 436.

751 Ibid, 435.

752 Perfilyev, “The Sino-Russian Space Entente,” 27.

753 Boeing acquired Hughes in 2000.

754 Harding, *Space Policy in Developing Countries*, 88.

755 Shu-Hsien, “Will China become a military space superpower?,” 208.

756 Perfilyev, “The Sino-Russian Space Entente,” 28-29.

757 The five other countries are Vietnam, Indonesia, Belarus, Zimbabwe and Syria.

758 Ibid, 30.

759 “China’s Space Activities in 2006,” *Information Office of the State Council of the People’s Republic of China*, accessed April 27, 2019, <http://www.china.org.cn/english/2006/Oct/183588.htm>.

760 Mu and Fan, “An Overview of Chinese Space Policy,” 424.

761 Cheng, “Chinese Concepts of Space Security,” 435.

762 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, 111.

763 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 143.

764 Ibid.

765 Krepon and Schoenberger, “Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013,” 131.

clouds of space debris – 525 large fragments in LEO – in history.⁷⁶⁶ The US quickly responded by conducting its own direct-ascent ASAT test in 2008.⁷⁶⁷

Regardless of the ASAT exchange with the US, China has continued its stride in space. The first lunar probe satellite, Chang'e-1, was quickly launched into orbit around the Moon, sending China into the field of deep space exploration.⁷⁶⁸⁷⁶⁹ In 2008, a taikonaut conducted a spacewalk for the first time outside the Shenzhou VII.⁷⁷⁰ The spacecraft released a small, manoeuvrable companion satellite called BX-1, which was presumably used to orbit around the Shenzhou Orbital Module, perhaps to train for a future docking, but could also have the ability to move in space and target other states' satellites.⁷⁷¹ The Chinese spaceflight notably passed only 45 kilometres from the ISS, leading analysts to believe that China had developed a co-orbital ASAT. 2008 also saw the joint support of China and Russia for the PPWT.⁷⁷² The US responded to all these events by shooting down an old spy satellite with a sea-based ABM system on the USS Lake Erie and sanctioning China for proliferation of missile-related technologies.⁷⁷³ US Congress blocked Beijing's effort to join the ISS through ITAR.⁷⁷⁴ During president Obama's visit to Beijing in 2009 and president Jintao's visit to Washington D.C. in 2011, both nations expressed willingness to discuss a closer space cooperation.⁷⁷⁵ However, the two space programs remain less engaged than the US and Soviet space programs during the First Space Age.⁷⁷⁶

In the last decade, China was on a clear path to join the US and Russia in possessing full-spectrum space capabilities.⁷⁷⁷ China demonstrated that it is capable of human spaceflight and that it possesses ASAT weapons and limited ABM systems.⁷⁷⁸ It also developed counterspace capabilities like satellite jamming technologies and ground-based lasers.⁷⁷⁹ One of the most important recent developments has been China's establishment of a reliable space-tracking network, a prerequisite to effective manned, commercial, and military programs.⁷⁸⁰ The space cadre is about two decades

766 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 143.

767 López, "Predicting an Arms Race in Space: Problematic Assumptions."

768 Hilborne, "China's Rise in Space and US Policy Responses," 122.

769 Chang'e-1 has provided the most accurate and highest resolution three-dimensional maps yet created of the moon's surface, including the dark side.

770 Harding, *Space Policy in Developing Countries*, 92.

771 Ibid, 93.

772 Moltz, "Russia and China: Strategic Choices in Space," 282.

773 Perflyev, "The Sino-Russian Space Entente," 30.

774 Moltz, "Russia and China: Strategic Choices in Space," 280.

775 Weeden, "U.S.-China Cooperation in Space: Constraints, Possibilities, and Options," 113.

776 Moltz, "Russia and China: Strategic Choices in Space," 280.

777 Weeden, "U.S.-China Cooperation in Space," 118.

778 Krepon and Schoenberger, "Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013," 131.

779 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 143.

780 Moltz, "Russia and China: Strategic Choices in Space," 279.

younger than its counterparts in the US and Russia, which are now retiring.⁷⁸¹ In 2010, China was able to intercept a missile in mid-flight, an essential component of an effective ABM system.⁷⁸² In 2011, the first portion of China's first space station, Tiangong I, was launched into LEO.⁷⁸³ China is now pushing to reach even more ambitious milestones in space, like going to the moon, while boosting its satellite coverage and the competitiveness of its launch service. Halfway through 2012, the LM SLV series had sent 190 spacecrafts into orbit over a total of 165 launches – with a success rate of 95 percent.⁷⁸⁴ The Shenzhou IX spacecraft and the Tiangong I docked successfully in 2012.⁷⁸⁵ Tiangong II and Tiangong III missions followed.⁷⁸⁶ Cooperative invitations were sent to Canada, the ESA, and Russia, with the US notably missing from the list.⁷⁸⁷ In May 2013, China reportedly tested ASAT capabilities that could reach critical US national security satellites in GEO.⁷⁸⁸ In late 2014, China opened the Wenchang Satellite Launch Centre on Hainan Island and is now aiming to “achieve a complete spectrum of space combat systems”. There are also indications that China has test flown an unmanned space plane, the Divine Dragon, similar to US and Russian capabilities.⁷⁸⁹ In late 2015, the PLA established the Strategic Support Force (SSF) with the responsibility of developing and employing most of China's space capabilities.⁷⁹⁰ In recent years, under President Xi Jinping, China's space program has been incorporated in the “China Dream” and “Belt and Road Initiative” to stimulate both military and civilian space infrastructure, industry and innovation.⁷⁹¹ In 2018, China tested ASATs in most categories and conducted more satellite launches than the US for the first time in history.⁷⁹² The LM-5 heavy lift SLV was prepared for comeback after a two-year hiatus, while China works towards a new modular space station and global, 24/7 coverage from its Beidou GNSS system.⁷⁹³

2.4 The Second Partial Conclusion: Space History is Earth History

The fourth subchapter of Chapter II presents concluding remarks and reflections based on the findings of the thesis so far. The purpose of the thesis is to explain why a space war has not yet

781 Ibid, 281.

782 Ibid.

783 Ibid.

784 Long and Li, “The Chinese Space Launch Program,” 869.

785 Mu and Fan, “An Overview of Chinese Space Policy,” 414.

786 Hilborne, “China's rise in space and US policy responses,” 123.

787 Harding, *Space Policy in Developing Countries*, 93.

788 Weeden, “U.S.-China Cooperation in Space,” 126.

789 Seedhouse, *The New Space Race: China vs. The United States*, 56-57, 75.

790 Kevin L. Pollpeter, Michael S. Chase and Eric Heginbotham, *The Creation of the PLA Strategic Support Force and Its Implications for Chinese Military Space Operations* (Santa Monica: RAND Corporation, 2017).

791 United States Defense Intelligence Agency, *Challenges to Security in Space*, 3-20.

792 Harrison et al., *Space Threat Assessment 2019*, 8.

793 Ibid, 10.

occurred, and the history of international space politics must serve that purpose. The second partial conclusion argues the history of international space politics in the First Space Age (1957-1991) and the Second Space Age (1991-) is very similar to the history of international politics on Earth in those same time periods.

The space race between US and the USSR was initially a weapons race spreading from Earth to space. It started perhaps already with the scramble for German rocket capabilities at the end of WWII. After the war, the US was the most powerful state in the world, and could have invested more in space, but had no urgent need to do so. The double-nuking of Japan proved to the world that the US in fact had the ability to deliver nuclear weapons across the globe. However, a rapidly growing USSR was catching up fast in both nukes and rockets. From the very beginning, international space politics played a central part in the Cold War. The quest for space power and power in general went hand in hand. Threats saw no borders, nor did the need to assure survival. The question quickly becomes: *how similar are the causes of war and space war?*

Moments of tension in space often occur during unstable times on Earth. The Space Age began after the Korean War, when Cold War war suspicions were already deep-rooted. A few years later, the USSR launched a manned space flight to draw attention away from the Berlin Crisis. Similarly, the Bay of Pigs fiasco triggered the iconic Apollo moon landing program. As the world stood on the brink of nuclear war around the time of the Cuban Missile Crisis, the US and USSR were developing and testing space weapons. The Soviet invasion of Afghanistan put an end to ASAT-talks and paved the way for the SDI, which ultimately helped cause the collapse of the USSR. The Great Leap Forward and the Cultural Revolution had direct consequences on China's space program. Stalin's death, the Sino-Soviet split, and the death of Mao were all important events in space history. The same can be said of incidents like Tiananmen Square, 9/11, Putin's ascendance to power, or, more importantly, the gradual rise of China.

The history of the First Space Age is in essence a history of the Cold War. The USSR took the first leap into space to project power and deter a nuclear US on Earth. At first, the US was caught by surprise and threatened by the Soviet superiority in space. Achievement after achievement was being used to prove the superiority of the Communist system. In essence, international space politics was a game of two superpowers circling each other, pushing the limits of space technology, demonstrating it in real life, and copying each other while making threats. However, the Cold War in space also ended with a collapse, as rising military expenditures proved too large for the Soviet economy.

The history of the Second Space Age is also a history of US dominance – even with a slow Russian revival and rapid Chinese growth with no end in sight. Since the end of the Cold War, the US has been the most advanced superpower the Earth has ever seen. Especially during the wars in the wake of 9/11, space power served as a key power component. The US has made bold, unilateral moves like pulling out of the ABMT, exploring weapons systems like “Rods from Gods”, and widespread use of force-enhancement, navigation, spying and missile defence. China and Russia feel threatened by this dominance. Therefore they are challenging US space superiority and taking advantage of its vulnerability. China, no longer focused only on commercial space, is testing space weapons while building legal resistance against them in the UN system together with Russia – at least the space weapons they don't have themselves. Russia is still a space superpower in many regards, but China is undoubtedly the “elephant in the room” called space.

Will China play the lead in the history of the Third Space Age? Leap-frogging on existing knowledge – especially from Putin's revivalist “patron space power” – the rising Chinese superpower has achieved impressive achievements in a short timeframe, taking its space program from fringe to world-class. Cutting-edge military counterspace capabilities, like ASATs, jamming and manoeuvrable microsatellites, have been developed, while new space alliances have been forged. The future in space is dependent on the future of Earth. China could overtake the US and become the next space superpower while Russia is making up for its lost decade. Meanwhile, a multitude of new states and private companies have begun competing for space power. If the most powerful states will ever go to war in space, it seems likely to be because of a ground conflict in some shape or form.

The second partial conclusion argues that the history of international space politics is very similar to the history of international politics. In hyperbole, “Space history is Earth history”, and the causes of space war seem to be closely related to the causes of major war in general. The Space Age began with a cold war superpower rivalry in space. Then, the US became the most powerful state. Now, China's space power is growing rapidly. Since international space politics is so closely related to international politics, there is a high risk of space capabilities being used together with nuclear weapons and other military capabilities in a potential great power war. A conflict on Earth could escalate into space, or a space war could lead to a major war on Earth. Thus, the two neorealist hypotheses, based on IR theory developed for international politics on Earth, both appear more plausible. The two different hypotheses will be tested in Chapter III.

CHAPTER III

A Neorealist Analysis of Space War in the First and Second Space Age

“You should not encamp in low-lying ground.”

– Sun Tzu, *The Art of War*.⁷⁹⁴

Chapter III is a neorealist analysis of the historical evidence presented in Chapter II based on the analytical framework established in Chapter I. The fundamental research question underpinning the thesis remains the same: *Why have the most powerful states on Earth never fought a war in space?* Or framed more precisely: *Why have the US, the USSR/Russia and China not overtly destroyed each others space assets through offensive action between 1957 and 2018?* The following eclectic, neorealist analysis of international space politics will try to answer the question by looking at the relationship between space war (the dependent variable) and the distribution of material space power among the three most powerful states in the international system (the independent variable). The goal is to determine whether the first and second neorealist hypotheses are correct and, more generally, why space war has never occurred.

The third chapter is organised in five subchapters. The first four subchapters each contain their own analysis of historical evidence from a given time period. In the first subchapter, the first neorealist hypothesis, based on Waltz’s defensive neorealism⁷⁹⁵ (DN) and Mearsheimer’s offensive neorealism⁷⁹⁶ (ON), is tested against the historical evidence from First Space Age. This historical analysis is meant to determine whether *a bipolar balance of space power in the international system has decreased the risk of space war*. The second neorealist hypothesis, based on Organski’s power transition theory⁷⁹⁷ (PTT) and Gilpin’s hegemonic stability theory⁷⁹⁸ (HST), is then tested against the evidence on the First and Second Space Age to determine if *a preponderance of space power in the international system has decreased the risk of space war*. Third, the first neorealist hypothesis (DN+ON) is tested against the evidence on the Second Space Age, before the second neorealist hypothesis (PTT+HST) is tested against the same evidence on the Second and potential Third Space Age in the fourth subchapter. The fifth and last subchapter of Chapter III is the third partial conclusion. The core argument of the partial conclusion is that the distribution of space

⁷⁹⁴ Sun Tzu and Samuel Griffiths, *The Art of War* (Oxford: Oxford University Press, 1971), 111.

⁷⁹⁵ Waltz, *Theory of International Politics*.

⁷⁹⁶ Mearsheimer, *The Tragedy of Great Power Politics*.

⁷⁹⁷ Organski, *World Politics*.

⁷⁹⁸ Gilpin, *War and Change in World Politics*.

power has been prone to peace in the First and Second Space Age, but that the risk of space war will be rising going into the Third Space Age.

3.1 The First Neorealist Analysis: Balance of Space Power in the First Space Age

The first subchapter of Chapter III is a neorealist analysis of international space politics in the First Space Age. The analysis is based on Waltz's defensive neorealism (DN) and Mearsheimer's offensive neorealism (ON). The goal is to test the first neorealist hypothesis, that a *bipolar balance* of space power in the international system has decreased the risk of space war in the First Space Age.

All the dangers associated with anarchy – the security dilemma, self-help behaviour, relentless competition and the constant risk of war – played a central part of international space politics from the beginning of the Space Age. To deal with insecurity in space, the superpowers developed space weapons to assure their own survival in the face of insecurity.⁷⁹⁹⁸⁰⁰ Under anarchy, argue both Waltz⁸⁰¹ and Mearsheimer⁸⁰², states develop military capabilities because they can never be sure of each others intentions. Logically, the development of space weapons in the early Space Age entailed a real risk of states using those weapons in armed aggression. Space – often dubbed the “final frontier” – was in fact conquered through war. Military inventions from WWII, like the radar, ballistic missile, computer and atomic bomb, played a central part in opening the space frontier in the 1950s.⁸⁰³ Furthermore, Sheehan has shown how the existential threat of the war made the conflicting states venture into space for the first time.⁸⁰⁴ The US and the USSR was triggered by two aggressive and at times technologically superior states, Japan and Germany, to invest heavily in the rocket capabilities that paved the way for the first SLVs.⁸⁰⁵⁸⁰⁶ While the US mostly ignored its own rocket scientists before the war, the USSR killed or imprisoned theirs.⁸⁰⁷ The historical evidence shows that their behaviour changed, however, when the two states' faced direct threats.

The security dilemma influenced state behaviour throughout the First Space Age. Insecurity in space was by no regards a mere by-product of WWII. As the war was coming to an end,

799 Sheehan, *The International Politics of Space*, 38.

800 Hays, *Space and Security*, 7.

801 Waltz, *Theory of International Politics*.

802 Mearsheimer, *The Tragedy of Great Power Politics*.

803 Dolman, *Astropolitik*, 77.

804 Sheehan, *The International Politics of Space*, 36-38.

805 Ibid.

806 Moltz, “Russia and China: Strategic Choices in Space,” 270.

807 Ibid.

practically annihilating several great powers, growing insecurity between the US and USSR carried over from Earth into space.⁸⁰⁸ Neither of the former allies would accept ending up inferior in advanced rocket technology, as this could cause their own annihilation in the future. In the aftermath of the war, the USSR rushed to make the larger and better rockets deter a nuclear attack carried out by US bomber planes.⁸⁰⁹ In other words, the security dilemma produced the Soviet R-7 rocket to fight nuclear war – a capability which would also carry a satellite into space as the first SLV.⁸¹⁰ The US explored the same technology, for example through RAND and ARPA, but was not incentivised from the threat of bomber planes.⁸¹¹ Having already fulfilled its fundamental need for survival, the US consequently lagged behind the USSR on investments in rockets, but saw a clear national interest in the added information from surveillance.⁸¹²

Space weapons were made to heighten security, but only escalated tensions and increased the risk of space war. Satellites were existential threats in and on themselves because the technology was so new and advanced at a time of rapid innovation in weapons technology.⁸¹³ Some satellites were obviously meant for spying, force-enhancement or early warning, but even those satellites could potentially have been the precursor of a new generation advanced space weapons. The first US ASAT tests were conducted while the two superpowers were unsure of each others intentions and level of sophistication.⁸¹⁴ Even after the signing of the Limited Test Ban Treaty, the OST and SALT I/AMBT, both states had well-founded fear of a surprise, first-strike ASAT attack. The dual-use nature of most space capabilities made the growing mistrust even harder to handle.⁸¹⁵ Ambitious, but defensive space programs, like the SDI, could just as well have been used for aggression in space.⁸¹⁶ Programs which appeared to be purely scientific, like research satellites, manned spaceflight programs, space shuttles and space stations, were motivated by fears and spurred new ones. Ground-breaking scientific milestones like the first human in space, the first human step on the moon and the first reusable space vehicle were considered potential threats due to the classic security dilemma.⁸¹⁷⁸¹⁸ Thus, as Pfaltzgraff has shown, destroying and defending those space assets became a matter of national security and survival.⁸¹⁹

The historical evidence suggests that the risk of space war was at its highest early and late in

808 Sheehan, *The International Politics of Space*, 38.

809 Ibid.

810 Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*, 1967.

811 Hays, *Space and Security*, 2

812 Sheehan, *The International Politics of Space*, 38.

813 Ibid, 27-29.

814 Hays, *Space and Security*, 17-18.

815 Dolman, *Astropolitik*, 39.

816 Johnson-Freese, *Space as a Strategic Asset*, 7.

817 Sheehan, *The International Politics of Space*, 48-49.

818 Hays, *Space and Security*, 19.

819 Pfaltzgraff, "International Relations Theory and Spacepower"

the First Space Age. Thus, most IR scholars seem to agree that realism's conflictual view of international politics explains this period the best.⁸²⁰⁸²¹ In the early 1960s, at a time of great instability on Earth, the US and the USSR developed and tested nuclear anti-satellite weapons for the first time (*See Figure 4*).⁸²² Space insecurity rose when the US tested and deployed a nuclear ASAT in the Pacific, while the USSR conducted high-altitude nuclear tests and when both states later began developing a range of more conventional ASAT weapons.⁸²³⁸²⁴⁸²⁵ In the years leading up to the Cuban Missile Crisis, various new ASATs – motivated by mutual fear – were being researched and developed.⁸²⁶ Considering how close the world came to nuclear war on Earth during the Cuban Missile Crisis, the risk of space capabilities becoming involved in a major war must be considered to be quite high.

In the late 1970s and 1980s, the world came closer to a space war yet again. The two superpowers converted large amounts of wealth into military space research while already wielding limited, yet operational counterspace capabilities.⁸²⁷⁸²⁸ As the relationship between the two superpowers deteriorated after failed ASAT arms control negotiations and the USSR invasion of Afghanistan, the US made risky moves to secure a favourable space power balance. The Space Shuttle was in many ways a huge US civilian space achievement, but was considered a potential weapon in the USSR – and it partly was – thus proving a thorn in the side during secret ASAT negotiations.⁸²⁹⁸³⁰ The development of the Miniature Homing Vehicle (MHV) meant that the US could shoot satellites from fighter jets in the 1980s.⁸³¹ Still, the SDI was perhaps the most provocative space program in the First Space Age. The program, which aimed to protect the entire US mainland from nuclear attack, threatened to leave both the USSR and China more vulnerable for a US first strike.⁸³²⁸³³ Many of the most radical SDI proposals never came to life⁸³⁴, but the USSR, which was in possession of less advanced, but operational counterspace capabilities, could not know that at the time and could easily have misinterpreted US behaviour. The USSR later urged the

820 Petroni and Bianchi, "New Patterns of Space Policy in the Post-Cold War World."

821 Weeks, *Politics of Space Law in the Post Cold War Era*

822 Krepon and Schoenberger, "Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013."

823 Mowthorpe, "US Military space policy 1945-92."

824 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 144.

825 Arbatov, "Russian Perspective on Spacepower".

826 Mowthorpe, "US Military space policy 1945-92."

827 Ibid, 29-30.

828 Moltz, "Russia and China: Strategic Choices in Space," 271.

829 Mutschler, 51.

830 Hays, *Space and Security*, 30-31.

831 Ibid, 38.

832 Sheehan, *The International Politics of Space*, 177.

833 Hitchens and Chen, "Forging a Sino-US "Grand Bargain" in Space," 129.

834 Webb, "Space Weapons: Dream Nightmare or Reality?" 33-34.

US to keep the SDI in the lab, but the US refused to cooperate.⁸³⁵ Considering Soviet fears of ABMs and the potential loss of second-strike nuclear capabilities⁸³⁶, programs like “Brilliant Pebbles” could have triggered a slowly failing USSR to engage in a first-strike in space. Indeed, the US was growing dependant on force-enhancing satellites for conventional wars at the time, making itself an increasingly attractive target.⁸³⁷

States turned to self-help behaviour and balancing – or “techno-nationalist realpolitik”⁸³⁸ – in space to deal with insecurity in the First Space Age. In the beginning of the First Space Age, in the face of anarchy and the omnipresent risk of war, states had to rely on their own efforts in space to survive. The physics of space made achieving security an incredibly hard, but similar task for all states. The US, the USSR and China all dealt with insecurity by emulating each other in the development of space capabilities, but still had different material capabilities at their disposal.⁸³⁹ The USSR channeled resources through from its growing state-controlled economy and large territory to make military space capabilities.⁸⁴⁰ The US did the same through a more dynamic, capitalist economy with more societal resources and higher technological competence.⁸⁴¹ China attempted to develop space capabilities as a part of its large, often failed collectivistic economic experiments.⁸⁴²

Two states – and two states only – could compete militarily in space during the First Space Age. As predicted by ON, insecurity constrained both the US and the USSR to develop military space capabilities to survive international space politics. The USSR was initially the leading space power in the international system, but by the mid-1960s, the US was showing signs of space power parity.⁸⁴³ To maintain the bipolar balance, the US and USSR invested in space capabilities that were most often dual-use, carrying with them a potential threat and the ability to strike back in case of attack. As soon as one state demonstrated an upper hand, the rival levelled the playing field. The USSR quickly followed the US in publicly announcing a IGY satellite.⁸⁴⁴ When the two Sputniks shifted the space power balance in the favour of the USSR, the US managed to counter with the Explorer I, in spite of some initial struggles.⁸⁴⁵ Further, the US used the Sputnik launches as a basis to establish a regimes that legitimised space overflight, later serving to its advantage by opening up

835 Mowthorpe, “US Military space policy 1945–92,” 30.

836 Harding, *Space Policy in Developing Countries*, 51.

837 Hays, *Space and Security*, 27-31.

838 Johnson-Freese and Erickson, “The Emerging China–EU Space Partnership.”

839 Sheehan, *The International Politics of Space*.

840 Aaron L. Friedberg, “The United States and The Cold War Arms Race,” in *Reviewing the Cold War: Approaches, Interpretations, Theory*, ed. Odd Arne Westad (London: Frank Cass, 2000), 207-231.

841 Ibid.

842 Harding, *Space Policy in Developing Countries*, 85.

843 Sheehan, *The International Politics of Space*, 29.

844 Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*, 146-149.

845 Hays, *Space and Security*, 9.

for spy satellites.⁸⁴⁶ Meanwhile, China started a satellite program of their own to balance against the two most powerful states in space.⁸⁴⁷⁸⁴⁸⁸⁴⁹⁸⁵⁰ The effort was aided by the USSR, serving as a soviet counterweight against US space cooperation with allies like Europe and Japan.⁸⁵¹ However, China kept lagging far behind the US and USSR in both civilian and military space capabilities.⁸⁵²⁸⁵³⁸⁵⁴ Furthermore, the space alliance between the USSR and China also suffered from mutual distrust under anarchy.⁸⁵⁵

The two superpowers used space weapons to balance against each other in space. Explicit or implicit nuclear ASATs tests were carried out on both sides until they were banned by the new international space regime.⁸⁵⁶ Since conventional ASATs were intentionally ruled out from the Limited Test Ban Treaty, the USSR established the PKO and started developing FOBS.⁸⁵⁷⁸⁵⁸⁸⁵⁹ When the USSR launched a man into space, the US went all the way to the moon.⁸⁶⁰ The Soviet Almaz station was a direct response to the US MOL project. Later, the US announced Space Station Freedom in response to the Soviet space station Mir. As the USSR grew powerful in co-orbital ASATs, the US invested in the MHV and the SDI programs.⁸⁶¹ At the same time, they adapted each others' two-track approaches to arms-control negotiations: negotiate while researching new space weapons. In the 1950s, the USSR was China's patron state, providing key technical assistance to China's nuclear and military space program.⁸⁶² In the 80s, China began successfully emulating US and Soviet launchers and satellites and scaled back its military space sector to enter the commercial space market.⁸⁶³ At the brink of collapse, the USSR balanced against the US in space by passing the buck to China through sales of key space capabilities and transfer of knowledge.⁸⁶⁴

The bipolar balance of space power seem to have decreased the likelihood of space war in the first half of the First Space Age. According to DN and ON, a clear bipolarity between the US

846 Ibid, 2-3.

847 Harding, *Space Policy in Developing Countries*, 83-86.

848 Shu-Hsien, "Will China Become a Military Space Superpower?" 206.

849 Perfilyev, "The Sino-Russian Space Entente," 21.

850 Long an Li, "The Chinese Space Launch Program," 869.

851 Harding, *Space Policy in Developing Countries*, 83-85.

852 Shu-Hsien, "Will China Become a Military Space Superpower?" 206.

853 Perfilyev, "The Sino-Russian Space Entente," 20-21.

854 Moltz, "Russia and China: Strategic Choices in Space," 277.

855 Perfilyev, "The Sino-Russian Space Entente," 21.

856 Krepon and Schoenberger, "Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013."

857 Anantatmula, "U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia," 144.

858 Arbatov, "Russian perspectives on Spacepower."

859 Moltz, "Russia and China: Strategic Choices in Space," 271-274.

860 Harding, *Space Policy in Developing Countries*, 60.

861 Mowthorpe, "US Military space policy 1945-92," 28.

862 Harding, *Space Policy in Developing Countries*, 83-84.

863 Ibid, 87-90.

864 Moltz, "Russia and China: Strategic Choices in Space," 279.

and USSR , gradually demonstrated through a “tit-for-tat” pattern of technological developments in SLVs, satellites, ASATs, human spaceflight, space shuttles and space stations, should have made space deterrence and space cooperation easier. Similarly, the historical evidence suggest that the bipolar balance of space power decreased risk of space war at a time of great tension. Especially in the years leading up to the Cuban Missile Crisis, the chances of miscalculation appear to have been high. However, the explicit linkage of military space capabilities into the nuclear deterrence doctrine of mutually assured destruction (MAD), made the consequences of attacking each other more obvious and thus simplified space deterrence.⁸⁶⁵ Drawing on Waltz, the two superpowers seem to have developed its first space weapons with eyes fixed only on each other.⁸⁶⁶⁸⁶⁷ The international space regime was initially established by the US for its own advantage, but eventually made the bipolar structure more durable both in Space and on Earth.⁸⁶⁸ The enormously destructive capability of nuclear ASATs, whose electro-magnetic pulse could impair the majority of satellites in orbit, highlighted the potential consequences of a first-strike in space.⁸⁶⁹

The bipolar balance of space power was easy to codify into an international space regime because the fear of relative gains was less of an issue. In the beginning of the First Space Age, the US used its power in international institutions to pass international law to legitimise spying and space weapons research – despite Soviet discontent.⁸⁷⁰ After a few years of increasing international tension, however, a new bipolar regime was established, first with the Limited Test Ban Treaty in 1963⁸⁷¹, the OST in 1967⁸⁷², the SALT I/ABMT in 1972⁸⁷³ and the US-Soviet “handshake in space” in 1975⁸⁷⁴. The new space regime was, largely synonymous with the “MAD doctrine”⁸⁷⁵, banned nuclear ASATs were banned⁸⁷⁶ scaled back ABMs⁸⁷⁷, but never placed a ban on conventional ASATs.⁸⁷⁸ Thus, space cooperation partly succeed in the face of anarchy because the bipolar balance of space power still rested on a bipolar distribution of military space capabilities within a slightly more restricted spectrum. Furthermore, the existence of satellites on both side made it easier

865 Forrest, *Deterrence and first-strike stability in space: A Preliminary Assessment*, 7.

866 Waltz, *Theory of International Politics*, 171.

867 Jackson and Sørensen, *Introduction to International Relations*, 77.

868 Forrest, *Deterrence and first-strike stability in space: A Preliminary Assessment*, 24.

869 Moltz, *Crowded Orbits*, 28.

870 Harding, *Space Policy in Developing Countries*, 42.

871 “Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water,”

872 “Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies,”

873 Harding, *Space Policy in Developing Countries*, 65.

874 Sheehan, *The International Politics of Space*, 65

875 Forrest, *Deterrence and first-strike stability in space : A Preliminary Assessment*, 7.

876 “Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water,”

877 Harding, *Space Policy in Developing Countries*, 65.

878 Hays, *Space and Security*, 23-24.

to gather information on nuclear capabilities and detect nuclear strikes before they even occurred.⁸⁷⁹ The result was that the international space regime became easier to enforce.⁸⁸⁰

The bipolar space power balance gradually eroded in the second half of the First Space Age, but the bipolar military space power balance did not fundamentally change. The US and the USSR were the only two countries with a limited arsenal of operational ASATs.⁸⁸¹ Furthermore, the linkages to nuclear power made bipolar structure of the international system sufficiently durable to keep space safe from war until the USSR suddenly collapsed and the First Space Age ended. As China, Japan and European state grew stronger in space, the space power balance became less bipolar and more multipolar.⁸⁸²⁸⁸³ According to DN and ON, the shifting space power balance should have made international space politics slightly more unpredictable, but the military bipolarity in space – coupled with a maturing international space regime – seems to have worked in the opposite direction by increasing stability. China opened the door the West after it grew sceptical of the USSR, but remained weak, especially in the military space sector, compared to the two superpowers.⁸⁸⁴ Meanwhile, a strengthening Europe and Japan decided to stay away from the most potent space weapons.⁸⁸⁵⁸⁸⁶⁸⁸⁷ The US, however, was slowly showing signs of superiority compared to the USSR. By the moon landing in 1969, the US had demonstrated a technological lead in space, but the lead did not extend into all weapons categories.⁸⁸⁸ Still, fearing that the USSR would conduct a first combined ASAT and nuclear strike, the US invested heavily in space weapons research through the SDI program.⁸⁸⁹ China, on the other hand, began building its commercial space sector and joined the international space regime, with a growing awareness of modern military space capabilities.⁸⁹⁰

The risk of space war during the First Space Age appear to have decreased because states seemed more inclined to maximised space security than space power. States sometimes attempted to maximise space power, but it seems to have happened in periods with the highest risk of armed confrontation in space. The USSR could be said to have maximized its space power in the years starting with the Sputnik launches, and so could the US response to the Sputniks. However, states

879 Harding, *Space Policy in Developing Countries*, 65.

880 Forrest, *Deterrence and first-strike stability in space : A Preliminary Assessment*, 7.

881 Krepon and Schoenberger, "Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013."

882 Petroni and Bianchi, "New Patterns of Space Policy in the Post-Cold War World."

883 Burzykowska, "Smaller states and the new balance of power in space,"

884 Shu-Hsien, "Will China become a military space superpower?," 208-209.

885 Harding, *Space Policy in Developing Countries*, 66.

886 Giannopapa, "Space Security Programs Worldwide: An Introduction," 720-721.

887 Sheehan, *The International Politics of Space*, 11, 88.

888 Dolman, *Astropolitik*, 82.

889 Mowthorpe "US Military space policy 1945-92," 29-30.

890 Harding, *Space Policy in Developing Countries*, 87-90.

developed space weapons primarily to stay secure. Furthermore, the US and USSR limited the development of nuclear ASATs quite early in the First Space Age. In spite of having highly provocative plans for military space, all the states held back on R&D to a certain degree to protect the tangible benefits from a secure space environment. The US, for example, chose the non-military Viking rocket design for its first satellite launch⁸⁹¹ and cancelled the Midas and Advent programs⁸⁹², as well as the X-20 Dyna-Soar⁸⁹³ and military MOL space station⁸⁹⁴. More importantly, the 505 and 437 nuclear ASAT programs were scaled down.⁸⁹⁵ After the superpowers signed the SALT I/ABMT, China cancelled its first human spaceflight program as it did not longer see the urgent security risk.⁸⁹⁶ International space regimes, though established and promoted to serve self-interest, were also attempts at increasing space security.⁸⁹⁷ The USSR, for example, reached out to sign a joint memorandum on stopping ASAT tests⁸⁹⁸ before unilaterally halting such tests⁸⁹⁹, and the US later decided to halt further unprovoked ASAT tests unless the USSR tested these capabilities first.⁹⁰⁰

However, high costs and technological immaturity clearly limited space power expansion in the First Space Age. Space activities have always been incredibly expensive and risky. Thus, balancing in space is quite rarely a straight-forward path. After the initial space race, soaring costs from practically endless room for expansion and limited usefulness forced states to make cheaper capabilities serving the most important goal – staying secure on Earth.⁹⁰¹ In the US, the Nixon administration tried to cut costs drastically.⁹⁰² The USSR had to adapt old technology to create an illusion of staying in the race⁹⁰³, while China made relatively small investments and even cancelled its human spaceflight program.⁹⁰⁴ In much of the First Space Age, space capabilities were still in their infancy, so even if states tried maximising space power, the technology behind space capabilities like space planes or space-based interceptors were often not mature.⁹⁰⁵ A long list of accidents, including the US Explorer⁹⁰⁶ and Challenger⁹⁰⁷ accidents, were proof that new space

891 Hays, *Space and Security*, 7.

892 Sheehan, *International Politics of Space*, 45.

893 Chun, "Viewpoint: Expanding the High Frontier: Space Weapons in History."

894 Mowthorpe, "US Military space policy 1945–92," 27.

895 Hays, *Space and Security*, 29-30.

896 Perfilyev, "The Sino-Russian Space Entente," 21.

897 Hays, *Space and Security*, 23-24.

898 Venet, "Space Security in Russia," 364.

899 Chun, "Viewpoint: Expanding the High Frontier: Space Weapons in History," 68.

900 Mowthorpe "US Military space policy 1945–92," 28-29.

901 Turner and Vedda, "The Impact of Foreign Space Developments on US Defense Policy," 318.

902 Ibid.

903 Sheehan, *International Politics of Space*, 30-31.

904 Perfilyev, "The Sino-Russian Space Entente," 21.

905 Sheehan, *The International Politics of Space*, 102.

906 Hays, *Space and Security*, 9.

907 Ibid, 29-30.

capabilities were often demonstrated in front of other states before they were ready. These facts support Mearsheimer's⁹⁰⁸ and Fredriksson's⁹⁰⁹ argument that land power ultimately is of highest value to human beings.

The goal of the first neorealist analysis was to test the first neorealist hypothesis, that *a bipolar balance of space power in the international system did decrease the risk of space war*, and explain why space war never occurred in the First Space Age. Anarchy had a profound influence on international space politics from the beginning. To deal with insecurity in space, the US and USSR developed space weapons to balance against each other. The bipolar balance of space power in the international system made the "space game" easier to predict and decreased the risk of space war, but did not make space completely safe from international competition or conflict. There were several moments of high risk in which space capabilities like rockets, satellites and ASATs were part of an extended nuclear brinkmanship between the US and USSR. Considering the Cold War risk of nuclear war on Earth, especially during the Cuban Missile Crisis and the 1980s weapons race, a space war was far from impossible. If these conflicts had escalated, they could have triggered a new sense of urgency leading to increased investments in new space weapons. However, states seem to have maximised space security to assure their own survival on Earth, while high costs and technological immaturity clearly limited space power expansion. In sum, the hypothesis is correct, but would be more precise if it included these additional factors. The conclusion is that *a bipolar balance of space power between the US and USSR, together with deep linkages to nuclear stability, high costs, technological immaturity and possible space security maximisation, did decrease the risk of space war in the First Space Age.*

3.2 The Second Neorealist Analysis: Space Power Transition between the First and Second Space Age

The second subchapter of Chapter III is a neorealist analysis of international space politics in the transition between the First and Second Space Age. The analysis is based on Organski's power transition theory (PTT) and Gilpin's hegemonic stability theory (HST). The goal is to test the first neorealist hypothesis, that *a preponderance of space power in the international system has decreased the risk of space war* in the transition between the First and Second Space Age.

Internal growth rates – just like anarchy – influenced international space politics from the

908 Mearsheimer, *The Tragedy of Great Power Politics*, 83-85.

909 Fredriksson, *Globalness: Toward a Space Power Theory*, 28.

beginning. According to PTT⁹¹⁰ and HST⁹¹¹, industrialisation and modernisation boosts the determinants of power. Since space power is deeply interlinked with other forms of power, especially military power, it too was boosted by the same forces.⁹¹² A robust, high-tech and adaptive economy has been and still is imperative to stay competitive in space.⁹¹³ A modern weapons industry and access to advanced materials, chemicals and electronics were the minimum requirements for developing space capabilities.⁹¹⁴ These resources were essential when trying to develop cutting-edge space capabilities like SLVs, satellites, ASATs and space stations.⁹¹⁵ In other words, internal growth rates affected which states were able to dominate international politics – both in space and on Earth.

Going into the First Space Age, internal growth rates had already begun shifting the power distribution in the international system. After WWII, the US was the most powerful state in the world, producing roughly half of the world's GDP, as its industry was left intact from large-scale bombing.⁹¹⁶ The war effort, which resulted in military inventions like the first nuclear bomb, showed that large-scale government spending on technological R&D could produce extraordinary military results.⁹¹⁷ Space capabilities, however, were not prioritised by the US⁹¹⁸, despite having captured world-leading German scientists and technology.⁹¹⁹ The USSR, on the other hand, invested heavily in space power to gain prestige and challenge a dominant US.⁹²⁰ When the US dropped nuclear bombs on Japan, the challenger surpassed the US in space capabilities by developing research groups, like the Ministry of Medium Machine Building, inside its centrally planned industrial-complex.⁹²¹ China was undoubtedly underdeveloped at the time, but started realising its potential for long-term industrial growth after a century of being dominated by stronger states.⁹²²

The USSR was a rising, dissatisfied challenger to the US on Earth, but was initially the most powerful state in space. In the years leading up to the first Sputnik launch, the USSR appears to

910 Organski, *World Politics*, 338-340.

911 Gilpin, *War and Change in World Politics*, 28-33.

912 Harding, *Space Policy in Developing Countries*,

913 Dolman, *Astropolitik*, 146.

914 Ibid, 77.

915 Harding, *Space Policy in Developing Countries*, 89.

916 Lundestad, *East, West, North, South*, 12.

917 McDougall, *The Heavens and the Earth*, 6.

918 Sheehan, *The International Politics of Space*, 38.

919 Harding, *Space Policy in Developing Countries*, 34-35.

920 Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*.

921 Siddiqi, *Challenge to Apollo: The Soviet Union and the Space Race, 1945-1974*, 119-161.

922 Harding, *Space Policy in Developing Countries*, 83-86.

923 Shu-Hsien, "Will China Become a Military Space Superpower?" 206.

924 Long an Li, "The Chinese Space Launch Program," 869.

925 Perilyev, "The Sino-Russian Space Entente," 20-21.

926 Moltz, "Russia and China: Strategic Choices in Space," 277

have transitioned from a state of potential space power to a state of rapid space power growth.⁹²⁷⁹²⁸⁹²⁹ Thus, the shifting power distribution on Earth began reflecting in the distribution of space power. The possession of new, dual-use space capabilities was demonstrated through a series of successful “firsts” to gain space prestige.⁹³⁰ Such demonstrations – from the R-7 and Sputnik to Gagarin’s spaceflight and the Vostoks – were obvious attempts at closing the general power gap to the US, and even surpass it. The USSR started on top in the hierarchy of space prestige, but entered a race it could not win in the long run. For a moment, the rising, dissatisfied challenger on Earth was the dominant state in space, but the USSR never became the dominant state in the international system.

The US was the dominant state of the international space order in the Second Space Age. Shocked by the rapid growth in USSR space power, the US began realising the potential space power resting in its advanced military capabilities, modern industry and large population – thus appearing to enter a stage of rapid transitional space power growth.⁹³¹⁹³²⁹³³ Being a “late starter” in space, the US could initially study Soviet pioneering efforts and leapfrog into the lead. Furthermore, international space politics was incorporated into the existing capitalistic international order. Through institutions like NATO, IMF, World Bank and GATT, the US distributed space power and space security to weaker states in return for loyalty.⁹³⁴ As with the League of Nations, the US were the leading force behind the UN, while the Soviets were negative at first. The UN, with headquarters in New York, initially was dominated by a western majority and ingrained in the Bretton Woods-based global free market system held up by US dominated institutions like the World Bank and the International Monetary Fund.⁹³⁵

The risk of space war seems to have peaked early in the First Space Age when the USSR used space to challenge the international order ruled by the dominant US. The USSR presented an alternative, communist order in opposition to the ruling capitalist one.⁹³⁶ Sputnik I and subsequent firsts in space made US allies question the whether the capitalist system was superior.⁹³⁷ In the aftermath, the USSR tried to impose new rules to ban overflight through the UN system, for example by blocking the US Open Skies initiative, but failed because the first satellite had taken

927 Sheehan, *The International Politics of Space*, 30-31.

928 Harding, *Space Policy in Developing Countries*, 58.

929 Hays, *Space and Security*, 19.

930 Sheehan, *The International Politics of Space*, 21, 40-41.

931 Hays, *Space and Security*, 9-22.

932 Sheehan, *The International Politics of Space*, 42.

933 Harding, *The Space Policy of Developing Countries*, 48-54.

934 R. R. Palmer, Joel Colton, and Lloyd Kramer, *A History of the Modern World: Since 1815* (New York: McGraw Hill, 2007), 896.

935 Ibid, 860.

936 Sheehan, *The International Politics of Space*, 31-31.

937 Ibid, 28.

advantage of that exact freedom.⁹³⁸ As a communist state, China followed in the footsteps of the USSR in space, embracing its revolutionary attempt at establishing a new order. However, the US fought back to preserve the status quo. Despite initially being weaker than the USSR in terms of space power, the US managed to establish an international space regime legitimizing spy satellites.⁹³⁹ Then, it successfully convinced other states into accepting the term “peaceful purposes” in the international treaties and register their space launches with the UN.⁹⁴⁰ Rapidly advancing US space capabilities in the form of spying satellites revealed that the communist alternative was less powerful than first assumed.⁹⁴¹ Regardless, two opposite orders came head to head in space in the 1960s, perhaps not coincidentally at the same time as when the US and the USSR started testing ASATs for the first time (*See Figure 4*).

The risk of space war seems to have decreased as the USSR proved incapable of changing the international space order. In the early 1970s, the two competing states demonstrated proximate parity in space and on Earth. The SALT/ABMT treaty in 1972 placed bans and limitations on space-based weapons and used modern verification methods based on surveillance and early-warning satellites, placing space power parity at the heart of international stability.⁹⁴² In 1975, the “handshake in space” made it look like the US and USSR were equals above the atmosphere.⁹⁴³ In reality, however, the USSR was facing decline. As the USSR’s cost of expansion in space rose, Gilpin would argue, system change proved too expensive for the unsatisfied challenger.⁹⁴⁴ As the USSR’s net gains from system change began decreasing, the US industrial base was realising enough potential space power to avoid a communist revision of the international order in space.⁹⁴⁵ Space – and the whole globe – was contested in the struggle for dominance, but the USSR could not keep up with US in the long run. As force-enhancement satellites took off in the late 1960s and 1970s⁹⁴⁶, the Soviet state proved less effective at adapting to new technology.⁹⁴⁷ Instead of fostering true innovation, it relied on old space capabilities to perform “stunts in space”⁹⁴⁸. By the moon landing in 1969, if not sooner, the US had demonstrated space power parity.⁹⁴⁹ As the US invested heavily in the SDI and successfully tested the MHV ASAT, the USSR had its proposed bilateral ASAT memorandum rejected, and unilaterally stopped testing ASATs altogether.⁹⁵⁰

938 Harding, *The Space Policy of Developing Countries*, 44.

939 Sheehan, *The International Politics of Space*, 40-46.

940 Hays, *Space and Security*, 16.

941 Hays, *Space and Security*, 12.

942 Harding, *Space Policy of Developing Countries*, 65.

943 Sheehan, *The International Politics of Space*, 65.

944 Gilpin, *War and Change in World Politics*, 185-193.

945 Friedberg, “The United States and The Cold War Arms Race.”

946 Hays, *Space and Security*, 27.

947 Sheehan, *The International Politics of Space*, 33.

948 Ibid, 30.

949 Dolman, *Astropolitik*, 82.

950 Chun, “Viewpoint: Expanding the High Frontier: Space Weapons in History,” 68.

The risk of space war rose again in the late 1980s and early 1990s because the USSR's space power was collapsing. Drawing the fundamental elements of PTT⁹⁵¹ and HST⁹⁵², there seems to have been a dangerous mismatch between hierarchy of space prestige and the actual distribution. The crisis of the 1990s left large gaps in the Soviet early warning satellite constellation.⁹⁵³ Considering the interconnectedness of nuclear and space capabilities, the risks were many. The USSR, who had based its security largely on a large nuclear arsenal, was left vulnerable to potential US first-strikes from space, threatening to render a core piece of its nuclear doctrine obsolete.⁹⁵⁴ Facing such a threat, the USSR could have decided to strike first – before it was too late – to have one last shot at changing the international order in its advantage. In such a scenario, ASAT weapons would be a natural part of a major war – as demonstrated by exercises and war games.⁹⁵⁵⁹⁵⁶ However, within short time after the Soviet collapse, the financial crisis dramatically reduced the USSR's ability to even maintain operational ASATs.⁹⁵⁷

The US came out stronger than the USSR from the transition between the First and Second Space Age. Institutions like the NATO, the IMF and the World Bank have all survived into the new millennium, while GATT has solidified into the WTO. As the ISS, dominated by the US⁹⁵⁸, became the primary symbol of international space cooperation, the international order was further consolidated.⁹⁵⁹ However, China already started appearing as a potential challenger on the US radar. Even before the USSR collapsed, the US began obstructing China's space industry.⁹⁶⁰ Already in the 1980s, China started looking like a potential challenger to the US in space as it transitioned into a role as a more commercial space power, gradually entering the international order dominated by the US.⁹⁶¹ After the tumultuous years of the the Great Leap Forward and the Cultural Revolution, which almost destroyed China's cadre of space scientists⁹⁶², China benefitted heavily from a latecomers advantage.⁹⁶³ This advantage was demonstrated through the rapid growth of companies like the Great Wall Industry Corporation (GWIC).⁹⁶⁴ In addition, China benefited from technological

951 Organski, *World Politics*, 376.

952 Gilpin, *War and Change in World Politics*, 9.

953 Moltz, "Russia and China: Strategic Choices in Space," 272.

954 Venet, "Space Security in Russia," 366.

955 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, xii.

956 Jana Robinson, "U.S. Space Security and Allied Outreach," in *Handbook of Space Security*, ed. Kai-Uwe Schrogl, Peter L. Hays, Jana Robinson, Denis Moura and Christina Giannopapa (New York: Springer, 2015), 331.

957 Venet, "Space Security in Russia," 357.

958 Johnson-Freese, *Space as a Strategic Asset*, 12-13.

959 Oberg, *Space Power Theory*, 59.

960 Harding, *The Space Policy of Developing Countries*, 87-88.

961 Lewis and Litai, *China's Strategic Seapower: The Politics of Force Modernisation in the Nuclear Age*, 165.

962 Harding, *Space Policy in Developing Countries*, 86.

963 Hays, *Space and Security*, 95.

964 Harding, *Space Policy in Developing Countries*, 87-88.

transfers from a cash hungry USSR.⁹⁶⁵⁹⁶⁶

The goal of the second neorealist analysis was to test the second neorealist hypothesis, that *a preponderance of space power in the international system has decreased the risk of space war*, and explain why space war never occurred in the transition between the First and Second Space Age. The USSR was a rising dissatisfied power that used space power to close the general power gap with the US. The mismatch between the hierarchy of space prestige and the distribution of the underlying components of space power increased the risk of space war in the early First Space Age. Deep power shifts in the international system were reflected in the distribution of space power. The First Space Age began with the growth of the USSR on Earth, but ended after what looked like a potent challenger, proved unable to compete with US industrial might in the long run. Even though the USSR had more space power The collapse showed that the USSR never had the potential to stay ahead of the US in space, because the US always had a larger potential for internal growth. As a consequence, the US international order survived the transition into the Second Space Age. In sum, the second neorealist hypothesis is partly correct, but it did not account for states' unfulfilled space power potential. Thus, the conclusion is that *a US preponderance in the underlying components of space power in the international system decreased the risk of space war in the transition between the First and Second Space Age*.

3.3 The Third Neorealist Analysis: Balance of Space Power in the Second Space Age

The third subchapter of Chapter III is a neorealist analysis of international space politics in the Second Space Age. The analysis, based on DN and ON, is meant to test the first neorealist hypothesis, that *a bipolar balance of space power in the international system has decreased the risk of space war* in the Second Space Age.

The Second Space Age started with a unipolar moment. After the Soviet “collapse in space power”⁹⁶⁷, the US was left alone as the dominant space power in international space politics. Going into the 1990s, the US was developing a full spectrum of new space capabilities, reaping the dual-use counterspace capabilities from the massive SDI investment while standing largely unopposed. The First Gulf War, launched on the back of the Bush administrations increasingly militaristic and

965 Shu-Hsien, “Will China become a military space superpower?,” 206.

966 Perfilyev, “The Sino-Russian Space Entente,” 20-21.

967 Arbatov, “Russian Perspectives on Spacepower.”

unilateralist space doctrine⁹⁶⁸, was dubbed the “first space war” because of the US display of cutting-edge force-enhancing military space capabilities.⁹⁶⁹ Meanwhile, US companies took the lead in the growing international space market (*See Figure 8*).⁹⁷⁰ Today, the US is still the leading force behind the ISS⁹⁷¹ and the only state to have used GPS-guided precision weapons in war.⁹⁷²

The risk of space war seems to have decreased substantially in the beginning of the Second Space Age because no other state could threaten the US in space – the ideal position for any state seeking security according to Mearsheimer.⁹⁷³ The US had, by force of all its satellites, the most to lose from a space war, but also the most space weapons to strike back. The US had already developed conventional and nuclear ASATs together with a slowly maturing ABM systems, both domestically and regionally. All of these space capabilities came on top of conventional military capabilities, which was in turn was enhanced further by US capabilities. Meanwhile, the USSR lost physical control over its primary spaceport, Baikonur, and important ground facilities as the union broke up in the transition between the First and Second Space Age.⁹⁷⁴ By joining both the ISS⁹⁷⁵ and the MTCR⁹⁷⁶, and commercialising and selling its space launchers⁹⁷⁷⁹⁷⁸⁹⁷⁹⁹⁸⁰, Russia appear to have admitted to US space hegemony – at least temporarily. Chinese space capabilities were growing, but placed under strict export controls by the US.⁹⁸¹ In sum, a space attack from any state could undoubtedly have been met with even harsher US attacks in retribution.

The US was a threat to other states in space in the second Space Age.⁹⁸² Several unilateralist moves in space proved that the distribution of space power was in fact unipolar. The US pulled out of the ABMT, a corner-stone treaty of space stability, on the back of an explicitly unilateralist space doctrine.⁹⁸³ After the 9/11 terrorist attacks, the US conducted what has been called “informationalised warfare” in Afghanistan and Iraq.⁹⁸⁴ All along, new space weapons ideas – like

968 Harding, *The Space Policy of Developing Countries*, 56.

969 Dolman, “Increasing the Military Uses of Space.”

970 Harding, *The Space Policy of Developing Countries*, 88.

971 Johnson-Freese, *Space as a Strategic Asset*, 12-13.

972 Moltz, *Crowded Orbits*, 135.

973 Mearsheimer, *The Tragedy of Great Power Politics*.

974 Venet, “Space Security in Russia,” 362.

975 Oberg, *Space Power Theory*, 59.

976 Mowthorpe, “US Military space policy 1945–92,” 32.

977 Kuznetsov, “Russian Space Launch Programs,” 777.

978 Oberg, *Space Power Theory*, 51.

979 Arbatov, “Russian Perspectives on Spacepower.”

980 Moltz, “Russia and China: Strategic Choices in Space,” 272-273.

981 “H.R.3616 - Strom Thurmond National Defense Authorization Act for Fiscal Year 1999.”

982 Johnson-Freese, *Space Warfare in the 21st century*, 21.

983 “U.S. Withdrawal From the ABM Treaty: President Bush’s Remarks and U.S. Diplomatic Notes.”

984 Hays, *Space and Security*, 51.

the “Rods for Gods” concept – were being explored.⁹⁸⁵ Space institutions under the UN provided some goods to China and Russia, but ultimately served the US better, as made clear by the latter states’ attempts at replacing central international space treaties.⁹⁸⁶ As the US invested in advanced defensive space power systems, the two other states faced a dilemma. Enter into an arms race with the US in space and potentially lose? Or give away sovereignty by being dominated by superior US space weapons circling above? Regardless, US dominance in space during the Second Space age was a source of insecurity to less powerful states.

China and Russia dealt with growing space insecurity by balancing against the US in space. China has built and tested a broad range of military space capabilities⁹⁸⁷, developed its own counterspace strategy based on the observed US “informationalised warfare”⁹⁸⁸, and lobbied for new international space weapons laws through the UN system.⁹⁸⁹ The EU and China has become less dependent on GPS by investing in the Galileo and Baidu navigation systems, which Bolton argues to be a form of techno-nationalist balancing.⁹⁹⁰ The two challengers have united to change the international space regime in their advantage by suggesting a ban on space-based weapons instead of Earth-based ASATs like the ones they possess themselves.⁹⁹¹ In order to stop the return of an idea like “Brilliant Pebbles”, China emulated the US and Soviet two-track approach. To develop ASATs while negotiating to ban them. Russian re-took control over some of the commercialised space sector, invested in and reorganised military space, and restarted GLONASS launches.

The risk of space war in the Second Space Age has so far peaked in 2007 and 2008. Ever since the mid 1980s, before the USSR collapsed and the Second Space Age ended, the two reigning superpowers had abstained from further ASAT testing.⁹⁹² Suddenly, the old bipolar balance of space power was gone. At first, the balance of space power became unipolar, allowing the US to pull out from a core space treaty like the ABMT.⁹⁹³ China, however, had a larger population and growing wealth from industry and advanced technology. Ever since the new millennium, China had been developing new space weapons. To prove that it was one of the countries with such a capability and realise its potential threat, China decided to begin conducting ASAT tests.⁹⁹⁴ By studying and emulation US “informationalised warfare”, China developed and demonstrated capabilities which

985 Johnson-Freese, *Space Warfare in the 21st century*, 65.

986 Moltz, “Russia and China: Strategic Choices in Space,” 282.

987 Weeden and Samson, *Global Counterspace Capabilities: An Open Source Assessment*, x-xiii.

988 Seedhouse, *The New Space Race: China vs. The United States*, 74.

989 Perfilyev, “The Sino-Russian Space Entente,” 29.

990 Bolton, “Neo-realism and the Galileo and GPS negotiations”

991 Moltz, “Russia and China: Strategic Choices in Space,” 276.

992 Krepon and Schoenberger, “Annex: A Comparison of Nuclear and Anti-Satellite Test, 1945-2013,” 135.

993 “U.S. Withdrawal From the ABM Treaty: President Bush’s Remarks and U.S. Diplomatic Notes.”

994 Anantatmula, “U.S. Initiative to Place Weapons in Space: The Catalyst for a Space-Based Arms Race with China and Russia,” 143.

can take advantage of US vulnerabilities in space. This has played into the historical fear of a new “Pearl Harbor” in the US. If a “tit for tat” pattern of ASAT testing had manifested, tensions between China and the US could have escalated into direct confrontation.

The gradual shift to multipolarity seems to have increased the risk of space war during the Second Space Age. For the last decades, new actors – primarily China – have been able to level the playing field, while space capabilities have become cheaper and more easily available.⁹⁹⁵ As Petroni and Bianchi found, economic leadership has become the foundation of military space supremacy in the multipolar world.⁹⁹⁶ China benefited greatly from what Mearsheimer's might call latent military space power⁹⁹⁷ from its rapidly growing commercial satellites industry, but Russia also focused its attention to its commercial sector in the Second Space Age.⁹⁹⁸⁹⁹⁹¹⁰⁰⁰¹⁰⁰¹ Multipolarity in space comes with increased complexity and likelihood of miscalculation. In that light, China's balancing act with an ASAT test in 2007 appear even more dangerous. The US answered in turn with their own ASAT test, destroying their own satellite to match the Chinese one circling Earth as scattered debris.¹⁰⁰² Russia's attempt in the last decade to counterbalance against the US has also been reflected in international space politics, in the shape of more state control, military spending and reorganisation, and new alliances. Sino-Russian space cooperation, however, is not running on full throttle, as China is now developing more capabilities at home, while Russia is *spending* more at home. Wohlforth argues that the current US unipolarity is stable because of the superpower's preponderance¹⁰⁰³, but judging by the behaviour of China and Russia, the perceived threat seems large enough to trigger balancing behaviour in space.

The quest for regional hegemony on Earth has increased the risk of space war. As China grows stronger, US military hegemony, especially in Asia, is being challenged. Satellites have long played an important part in wars far off the US mainland. From Vietnam to the two wars in Iraq, the Balkan Wars, Afghanistan: military space capabilities have been involved involved in all of them. Similarly, the US military presence in the western Pacific also relies on space power to a high degree. The US still enjoys an overwhelming space superiority compared to China and Russia (*See Figure 6*), but experts believe that China aims to use its rapidly growing arsenal of asymmetric counterspace capabilities to deny US space dominance in case of a conflict in Asia over

995 Burzykowska, “Smaller states and the new balance of power in space.”

996 Petroni and Bianchi, “New Patterns of Space Policy in the Post-Cold War World.”

997 Mearsheimer, *The Tragedy of Great Power Politics*, 55-56.

998 Kuznetsov, “Russian Space Launch Programs,” 777.

999 Oberg, *Space Power Theory*, 51.

1000 Arbatov, “Russian Perspectives on Spacepower.”

1001 Moltz, “Russia and China: Strategic Choices in Space,” 272-273.

1002 Grego, *A History of Antisatellite Programs*.

1003 Wohlforth, “Realism and the End of the Cold War”, 7

critical national interests, such as the status of Taiwan.¹⁰⁰⁴¹⁰⁰⁵ In a potential war over the Taiwan or Spratly Islands, China could be tempted to try to delay US aircraft carriers by destroying, blinding or jamming the satellites such carriers rely on for navigation, coordination and precision strikes.¹⁰⁰⁶ The strategy involves denying opponents access to information by interfering with their space capabilities and thereby retarding their command and control. In short, by denying an opponent the ability to use space freely, the PLA would be denying them the ability to achieve information dominance and therefore make them less able to fight an “informationalised war”. O’Hanlon predicts that if “China could find major U.S. naval assets with satellites, it would only need to sneak a single airplane, ship, or submarine into the region east of Taiwan to have a good chance of sinking a ship”¹⁰⁰⁷, thus deterring the US from entering a war to protect its allies. Similarly, Russia has demonstrated operational counterspace capabilities in regional conflicts in Chechnya¹⁰⁰⁸ as well as Ukraine and Syria¹⁰⁰⁹.

The risk of space war decreased during the Second Space Age because states still maximised space security to a high degree, and because technological maturity and high costs are still important factors. China's ASAT test in 2007 can not be labelled space security maximisation, but after the US response in 2008, the US approach in space actually shifted to become *less* confrontational and slight more accepting to a multipolar balance of space power in the international system.¹⁰¹⁰¹⁰¹¹ Even at the peak of the unipolar moment in space, with space weapons like “Rod from Gods” on the drawing board, the US never placed weapons permanently in orbit. Instead of using its ASAT weapons when it suddenly became an underdog, Russia cooperated with the US, though much out of necessity. The Columbia accident in 2003, showed that even the state with the most space power – in this case the US – was struggling to develop safe and functioning space capabilities.

However, a number of factor predicts a dangerous future in international space politics. The true nature of new space capabilities continued to be blurred due to its dual-use. According to the Pentagon, roughly 95 percent of space technologies can be considered dual use.¹⁰¹² As Mutschler

1004 Moltz, *Crowded Orbits*, 136.

1005 Michael Krepon, “Space and Nuclear Deterrence,” in *Anti-satellite Weapons, Deterrence and Sino-American Space Relations*, ed. Michael Krepon and Julia Thompson (Washington D.C.: Stimson Center, 2013), 34-35.

1006 Michael E. O’Hanlon, “Balancing U.S. Security Interests in Space,” in *Toward a Theory of Space Power: Selected Essays*, ed. by Charles D. Lutes and Peter L. Hays with Vincent A. Manzo, Lisa M. Yambrik, and M. Elaine Bunn (Washington, D.C.: Institute for National Strategic Studies - National Defense University, 2011).

1007 Ibid.

1008 Gouveia “An Assessment of Anti-Satellite Capabilities and their Strategic Implications.”

1009 Venet, “Space Security in Russia,” 364.

1010 Smith, “President Obama's National Space Policy: A change in tone and a focus on space sustainability,” 20-23.

1011 Brachet and Pasco, “The 2010 US space policy: A view from Europe,” 11-14.

1012 Johnson-Freese, *Space Warfare in the 21st century* 34.

has argued, space security cooperation must produce balanced gains to stand a chance for success¹⁰¹³, but as Hansel has pointed out, the US, China and Russia have opposing interests on space arms control.¹⁰¹⁴ The incentives for striking first in space, which according to Glaser and Kaufmann¹⁰¹⁵ is an important factor in explaining the likelihood of war in the international system, is made worse by limitations in space situational awareness (SSA)¹⁰¹⁶. Perhaps more importantly, the US and China – the two most powerful states on Earth – have little to no cooperation in space, leaving slim chances for successful, substantial space cooperation based on balanced, relative gains.¹⁰¹⁷ Ultimately, as Bahney and Pearl have recently concluded in *Foreign Affairs*, “[e]ven if it were possible to convince Moscow and Beijing of the benefits of comprehensive space arms control, existing technology makes it extremely difficult to verify compliance with the necessary treaty provisions—and without comprehensive and reliable verification, treaties are toothless”¹⁰¹⁸.

The goal of the third neorealist analysis was to test if a *bipolar balance of space power in the international system has decreased the risk of space war*, and explain why a space war never occurred in the Second Space Age. Space, just like Earth, experienced a unipolar moment beginning in the early 1990s. After the virtual space power collapse of the USSR, the US reigned supreme above the Kármán line. The US grew stronger due to the large military space investments in the 1980s. In the short run, the unipolar balance of space power decreased the risk of space war because no other state risked attack, but in the long run, the US was a large threat to less powerful states in space. China and Russia counterbalanced through large investments in military space capabilities, new treaty proposals and new alliances. Consequently, the balance of space power became more multipolar and the risk of miscalculation and space war increased. In sum, the first neorealist hypothesis, as formulated, is wrong. A bipolar balance of space power was not the reason why a space war did not occur in the Second Space Age. Both DN and ON are right, however, in recognising that unipolar systems are safe, but quickly erode because other states counterbalance in the international system. The conclusion is that *a US unipolarity of space power and its underlying components in the international system, together with high cost, technological immaturity and possible space security maximisation, has decreased the risk of space war in the Second Space Age, but a shift towards a more multipolar space power balance, with increased complexity and competition for regional hegemony on Earth, has increased the risk.*

1013 Mutschler, “Security Cooperation in Space and International Relations Theory.”

1014 Hansel, “The USA and Arms Control in Space”

1015 Glaser and Kaufmann, “What is the Offense-Defense Balance and How Can We Measure It?”

1016 Forrest, *Deterrence and first-strike stability in space: A Preliminary Assessment*, 16

1017 Pace, “How far – if at all – should the USA cooperate with China in space?,” 127-130.

1018 Benjamin Bahney and Jonathan Pearl, “Why Creating a Space Force Changes Nothing,” *Foreign Affairs*, March 26, 2019, <https://www.foreignaffairs.com/articles/space/2019-03-26/why-creating-space-force-changes-nothing>

3.4 The Fourth Neorealist Analysis: Space Power Transition between the Second and Third Space Age

The fourth subchapter of Chapter III is a neorealist analysis of international space politics in the ongoing transition between the Second and Third Space Age. The analysis, based on PTT and HST, is meant to test the second neorealist hypothesis, that *a preponderance of space power in the international system has decreased the risk of space war* in the ongoing transition between the Second and Third Space Age.

China is undoubtedly rising in space. A high internal, industrial growth rate has given China a rapidly growing industrial base for advanced space capabilities.¹⁰¹⁹ The resulting increase in space power is shifting the balance of space power in the international system (See Figure 2, Figure 4, and Figure 5). In the ongoing transition to the Third Space Age, China has started harvesting the fruits of its long-term industrial growth strategy, which touches on a broad range of capabilities related to space capabilities.¹⁰²⁰ Already in the transition between the First and Second Space Age, when China gradually opened to the West, space capabilities and western concepts of military space was transferred back to Beijing, mainly through the global commercial market.¹⁰²¹ What separates China from the USSR is the speed of its rise in space and total lack of cooperation with the US (See Figure 5).¹⁰²² China has achieved many of the same “firsts” as the US and USSR, but in a shorter period of time due to its latecomers advantage.¹⁰²³ Costs are lower in China, which makes it cheaper for China to challenge the US dominated international order.¹⁰²⁴

China has benefited from its own backwardness in space capabilities. Unlike the pioneering efforts of the US and the USSR, China benefited greatly from previous achievements in space.¹⁰²⁵ In everything from energy sources to electronics, China has been able to copy or buy existing capabilities. China has learned from US warfare¹⁰²⁶, and copied and bought operational Russian space capabilities.¹⁰²⁷ Space scientists and engineers are younger in China.¹⁰²⁸ All these trends are fuelled by the fact that China, as a late starter, close the space power gap to other states by “leap-

1019 Shu-Hsien, “Will China become a military space superpower?,” 206.

1020 Shu-Hsien, “Will China Become a Military Space Superpower.”

1021 Lewis and Litai, *China’s Strategic Seapower: The Politics of Force Modernisation in the Nuclear Age*, 165.

1022 Krepon, “Space and Nuclear Deterrence,” 17.

1023 Hays, *Space and Security*, 95.

1024 Kahn and Kahn, “Chinese Capabilities as a Global Space Power.”

1025 Hays, *Space and Security*, 95.

1026 Cheng, “Chinese Concepts of Space Security,” 438.

1027 Moltz, “Russia and China: Strategic Choices in Space,” 279.

1028 Ibid, 281.

frogging”. As Johnson-Freese has noted, “[w]hat industrialization was to development in the 1960s, knowledge is in the new millennium”¹⁰²⁹.

The risk of space war seems to have increased because China is at least a partly dissatisfied challenger that wants to change the international space order dominated by the US. China has tested conventional ASATs while trying to win support for treaties banning space-based ASATs a central parts of its alternative order.¹⁰³⁰ Simultaneously, China has begun distributing wealth, space security and material space power through various projects and institutions.¹⁰³¹ For example, China helps collect, coordinate and share SSA-data through APSCO.¹⁰³² Gilpin¹⁰³³ would probably argue that China has demonstrated its military space capabilities in order to climb the ladders in the international hierarchy of space powers. China has also cooperated closely with the EU on large projects like Galileo¹⁰³⁴, reached out to Brazil¹⁰³⁵, established APSCO¹⁰³⁶, distributed receiving stations¹⁰³⁷, and generally expanded its cooperative network of space fearing states.¹⁰³⁸ Often, the new space partners like Nigeria and Venezuela have provided China with resources which could fuel the industrial growth driving the space power shift in the international system.¹⁰³⁹

The risk of space war seems to have increased because the US is trying to keep China from becoming the dominant state. As the space power of the Chinese challenger grew, the US has tried to protect its own international order in space by using some of the strategies described by Organski¹⁰⁴⁰ and Gilpin¹⁰⁴¹, mainly engaging in half-measures to delay industrialisation. The current US-Chinese confrontation in space started growing already in the 1980s¹⁰⁴², when the US grew wary of the role space capabilities transfers in international business.¹⁰⁴³ In the following decade, the combination of the SDI project¹⁰⁴⁴, the Chinese repression of students at Tienanmen Square¹⁰⁴⁵, the Loral-Hughes incident and the following Cox Commission Report¹⁰⁴⁶ lead to an ice cold relationship between the US and China. The US began to execute strict export controls on space-

1029 Johnson-Freese, *Space as a Strategic Asset*, 9.

1030 Chun, “Viewpoint: Expanding the High Frontier: Space Weapons in History,” 68-69.

1031 Bowe, “China’s Pursuit of Space Power Status and Implications for the United States,”

1032 United States Defense Intelligence Agency, *Challenges to Security in Space*, 20.

1033 Gilpin, *War and Change in World Politics*, 31.

1034 Johnson-Freese and Erickson, “The Emerging China-EU Space Partnership,” 18.

1035 Hou and Liu, “Chinese Satellite Programs: An Internal View,” 887.

1036 Cheng, “Chinese Concepts of Space Security,” 436.

1037 Ibid.

1038 Harding, *Space Policy in Developing Countries*, 89-95.

1039 Cheng, “Chinese Concepts of Space Security,” 435.

1040 Organski, *World Politics*, 347-349.

1041 Gilpin, *War and Change in World Politics*, 31-34.

1042 Harding, *The Space Policy of Developing Countries*, 87-88.

1043 Perfilyev, “The Sino-Russian Space Entente,” 21.

1044 Hitchens and Chen, “Forging a Sino-US “Grand Bargain” in Space,” 129.

1045 Harding, *The Space Policy of Developing Countries*, 87-88.

1046 Perfilyev, “The Sino-Russian Space Entente,” 27.

related dual-use technology¹⁰⁴⁷ and still upholds the specifically targeted Wolf Amendment blocking commerce and cooperation with China.¹⁰⁴⁸ The US has blocked Beijing's effort to join the ISS.¹⁰⁴⁹ Furthermore, the US has not accepted any of the proposed space weapons bans drafted by Russia or China, mainly because space weapons based on Earth are not included in the proposals, but continue to research and develop everything from space planes to duals ABM systems despite protests from other states.¹⁰⁵⁰

The risk of space war has probably not peaked yet in the ongoing transition between the Second and Third Space Age. China's decision to display its emerging counter-space capabilities can be viewed as the result of long-standing opposition towards the existing international space order.¹⁰⁵¹ The direct-ascent ASAT test in 2007 marked a turning point in international space politics because it was the first reciprocal ASAT tests since the 1980s. Obviously, a third challenger had entered the international boxing ring in space. At this point in time, China looks like a more potent challenger to the US in the long run than the USSR. China's industry continue to grow and space capabilities are rapidly becoming more advanced. There seems to be a growing mismatch between the hierarchy of space prestige and the actual distribution of space power. Unfortunately, the most likely result is an increased risk of space war going into the future.

If China's space power grows at speeds similar to those demonstrated in the last decades, PTT and HST predicts that the risk of space war will keep increasing. China is still acting within the capitalistic international order in space dominated by the US, but what will happen in the next decade? Will it become cheaper for China to change the system? To which degree does China want to change the system? If China's net gains from system change increase, and the costs of maintaining the system increase for the US, the challenge could perhaps spread from within the UN to other institutions. The failure of the USSR to challenge the US teaches us a valuable lesson. The underlying components of space power will ultimately determine whether China can become the dominant state in international space politics. "Show-off" space capabilities can easily generate short term prestige, but they do not guarantee survival in the long run. PTT and HST predicts that the US stands in danger of entering a phase of space power maturation. Will the US open the door for space cooperation as China becomes more powerful? If not, does that mean a space war will occur as two new superpower approach parity in space power? If so, who will attack first? The rising challenger who can finally throw a real punch? Or the dominant space power losing its grip?

1047 Harding, *The Space Policy of Developing Countries*, 88.

1048 Johnson-Freese, *Space Warfare in the 21st Century*, 84.

1049 Ibid.

1050 Moltz, "Russia and China: Strategic Choices in Space," 280-282.

1051 Ibid.

Regardless, Russia – together with a wide array of other states – will become the joker in an increasingly dangerous relationship between the US and China. Will Russia continue to side with China if it builds an alternative, international space order? Or stay sides with the US international order it has criticised and worked to change?

The goal of the fourth neorealist analysis was to test if *a preponderance of space power in the international system has decreased the risk of space war*, and explain why a space war has not yet occurred in the ongoing transition between the Second and Third Space Age. The US is still the dominant state in space, but China is a rising, at least partly dissatisfied challenger. Furthermore, China seems to have more space power potential than the USSR. The risk of space war so far was at its highest around 2007 and 2008, when both the US and Chinese tested ASATs on their own satellites for the first time in several decades, but will probably peak later in the space power transition between the Second and Third Space Age. China is currently using its growing space power to challenge the US order in space, and the cost of system change might be decreasing. At the same time, the US, whose space power might be maturing, is trying to stop China from becoming the dominant state in international space politics. If China keeps growing, the most dangerous moment in the Space Age is yet to come. In sum, the second neorealist hypothesis is correct, but might not stay correct as the transition from the Second and Third Space Age unfolds. The conclusion is that *a US preponderance of space power and its underlying components in the international system has decreased the risk of space in the transition between the Second and Third Space Age, but the risk of space war is increasing because China is a rapidly rising and at least partly dissatisfied challenger both in space and on Earth.*

3.5 The Third Partial Conclusion: Towards a Dangerous Future in Space

The fifth subchapter of Chapter III presents concluding remarks and reflections based on the findings of the thesis so far. Historical evidence on both the First and Second Space Age has been analysed using Waltz's defensive neorealism (DN) and Mearsheimer's offensive neorealism (ON) in combination. The transition between the First and Second Space Age, and between the Second and Third has been analysed using Organski's power transition theory (PTT) and Gilpin's hegemonic stability theory (HST). As a synthesis of these four analyses, the third partial conclusion argues that the distribution of space power in the international system has been prone to peace so far in both the first and Second Space Age. Going into the third space age, however, the risk of space war is increasing according to all four neorealist theories.

Anarchy and uneven growth rates have both influenced international space politics throughout the Space Age. Under anarchy, the threat of US nuclear weapons made the USSR – the communist challenger – develop more advanced rockets. However, the USSR would never have had the ability to develop so advanced space capabilities without the rapid transitional growth and benefits of backwardness it was experiencing. In similar fashion, space weapons were developed due to a security dilemma in which nuclear ASATs were followed by conventional ones, but the security dilemma occurred in the first place because the USSR had grown into a superpower – in spite of losing millions of people and large cities in WWII. Insecurity stayed high even when the US was the sole superpower in space and no other state dared to attack it. Now, China is the challenger rising up from rapid growth, approaching both power and space power parity, creating new security dilemmas. A multitude of states is following behind, creating increased risk of miscalculation and number of potential conflicts in international space politics. With all this insecurity, why has there never been a space war?

Neorealist scholars agree that distribution of power in the international system is the key to explain the likelihood of war. The two neorealist hypotheses on space war, formulated in the introduction, are built on extrapolations from some of the most prominent among them. In a neorealist analysis, the space power would be defined as material capabilities like SLVs, satellites, spaceports, ASATs, ground stations and space stations. Space capabilities are most often dual-use, blurring the lines between civilian and military, and offensive and defensive.

The first neorealist hypothesis suggested that *a bipolar balance of space power in the international system has decreased the risk of space war*. The hypothesis was tested in the first neorealist analysis against the historical evidence of the First Space Age. Seen through the theoretical lenses of DN and ON, the history of international space politics in that time period shows that *a bipolar balance of space power between the US and USSR, together with deep linkages to nuclear stability, high costs, technological immaturity and possible space security maximisation, did decrease the risk of space war in the First Space Age*. In other words, the first neorealist hypothesis was correct, but would be more precise if it took into account the last three additional factors.

The second neorealist hypothesis, on the other hand, suggested that *a preponderance of space power in the international system has decreased the risk of space war*. The hypothesis was tested in the second neorealist analysis against the historical evidence on the transition between the First and Second Space Age. Through the theoretical lenses of PTT and HST, the history of international space politics in the time period shows that *a US preponderance in the underlying*

components of space power in the international system decreased the risk of space war in the transition between the First and Second Space Age. In other words, the hypothesis was partly correct.

The third neorealist tests the first neorealist hypothesis against evidence on the Second Space Age. The conclusion is that *a US unipolarity of space power and its underlying components in the international system, together with high cost, technological immaturity and possible space security maximisation, has decreased the risk of space war in the Second Space Age, but a shift towards a more multipolar space power balance, with increased complexity and competition for regional hegemony on Earth, has increased the risk.* Thus, the first neorealist hypothesis is wrong when applied to the Second Space Age, but DN and ON have recognised that unipolar systems are safe, but unstable.

The fourth neorealist analysis tests the second neorealist hypothesis against evidence on the transition between the Second and Third Space Age. The conclusion is that *a US preponderance of space power and its underlying components in the international system has decreased the risk of space in the transition between the Second and Third Space Age, but the risk of space war is increasing because China is a rapidly rising and at least partly dissatisfied challenger both in space and on Earth.* To conclude, the second neorealist hypothesis is correct, but might not stay correct as the transition from the Second and Third Space Age unfolds.

Four neorealist theories, divided in two opposing camps on the question of space war, collectively conclude that the space power distribution in the First and Second Age has been fundamentally prone to peace in space. The First Space age had a bipolar balance of space power, but the USSR never truly reached parity with the US in the underlying components of space power in the transition to the Second Space Age. For a decade or two, the US experienced a unipolar moment in space. However, more and more states are realising their space power potential and beginning to balance back in space. Most powerful among them is China, which is growing fast both in space and on Earth. In combination, DN, ON, PTT and HST conclude that the international system was prone to peace in space, and that the future in space is dangerous. They disagree, however, on *why* space has stayed secure and stable, and exactly *why* the future is dangerous.

In order to draw conclusions from four partly diverging theories, we must use an eclectic approach. Analytical eclecticism seeks pragmatism, problems with wide scope and selective recombination of analytical components from explanatory theories embedded in competing research traditions. Yes, the four neorealist theories produce different explanations on why space war never

occurred, but that is not only a negative thing. By using theories with many similarities and some differences, the analysis becomes more rich in the face of complex, messy, real-world problems.

The four neorealist theories all conclude that the world is approaching a dangerous moment in international space politics. The US is still the most powerful state in space, but China is a growing challenger. The US and China do not have – and never have had – any substantial cooperation in space. They are at different stages technologically, making it harder to perform symbolic “handshakes in space” like the US and USSR did in 1975. Meanwhile space is getting crowded, more multipolar, has more potential conflicts and higher risk of miscalculation. States are using space capabilities to challenge the US to regain regional hegemony. Thus, an eclectic neorealism concludes that the Third Space Age is likely to be the most dangerous moment in the history of international space politics.

A future space war will most likely be part of a great power conflict on Earth. The thesis has showed that international space politics can not be treated as totally exogenous to international politics. Space power is deeply interlinked with power. In international politics, space capabilities can be seen as a form of latent power. Space power insufficient to control the outcome of terrestrial conflicts, but can be a force-enhancer to essential ground troops. Thus, in international *space* politics, “Earth power” is latent to space power. States need certain material capabilities on Earth to launch satellites into orbit. The satellites then increase states' space power and give them useful information for military operations on the ground. In other words, states need “Earth power” to make space power, but space power give them more “Earth power” in return. The causes of space war are also deeply interlinked with causes of great power war. A state cannot just use space weapons to shoot down another state's satellite without expecting a reaction on Earth. Similarly, a state cannot go to war with a country on Earth and expect that space weapons to be left out of the fighting. Through surveillance and data collection, space capabilities have become part of the very structure of international security and stability. Thus, an attack on space capabilities would be a destabilising, provocative and therefore risky move.

Some factors can still ease concerns. States due seem more inclined to maximise space security than space power. High cost and technological immaturity puts a constant limit on space activities. China is still mostly challenging the US within the existing international order. However, anarchy can sometimes force states to maximise space security by building space weapons because the risk of space war is *actually* high. The cost of space capabilities has fallen drastically, while the technology has rapidly improving. China is challenging the US more directly in its own backyard in South-East Asia, and eventually might reach parity with the US both in space power and its

underlying components.

The third partial conclusion argues that the distribution of the space power has been fundamentally prone to peace so far in the Space Age. Anarchy and uneven growth rates have both influenced international space politics, but a space war has still never broken out. Chapter III contains four neorealist analyses that test different two neorealist hypothesis against historical evidence. When combined in an eclectic approach to international space politics, the four neorealist theories concludes that *a space war has not occurred in the Space Age because the space power distribution in the international system has been bipolar and unipolar while no state has reached parity with the US in the underlying components of space power.*

CONCLUSION

*“The advent of spaceflight produced a fundamental historical disjuncture,
only dimly perceived at first, between industrial modernity,
and the post-modernity of the information age. (...)
The space age is the age of global politics.”*

– Michael Sheehan, International Politics of Space.¹⁰⁵²

This master thesis in International Relations (IR) has attempted to answer a simple question. Why have the most powerful states on Earth never fought a war in space? The neorealist answer is that the distribution of space power in the international system has so far been prone to peace in space, but also that the distribution is gradually becoming more dangerous. A history of international space politics between 1957 and 2018 has been analysed using a theoretical framework built on four different neorealist theories. If defined widely enough, neorealism can include at least defensive neorealism (DN), offensive neorealism (ON), power transition theory (PTT) and hegemonic stability theory (HST). The four theories have much in common, but are divided on the question of war. Two neorealist hypotheses, one for each “camp”, have been formulated and tested against historical evidence. The conclusion is that the distribution of space power has been bipolar in the First Space Age and unipolar in the Second Space, but in the underlying components of space power, neither the USSR/Russia or China have ever reached up to the US.

The risk of space war has been significant from the early Space Age into the present. Space is not and has never been a sanctuary from military conflict. The security dilemma has caused insecurity higher than 100 kilometres above the surface of the Earth – and so have uneven growth rates. Space – the “final frontier” – was conquered using military technology from WWII. After a modified ICBM carried Sputnik into space, the US and USSR quickly started developing space weapons to defend their satellites through deterrence. The risk of space war peaked in the early 1960s, when the US and USSR developed and tested the first anti-satellite weapons in a highly volatile international system. First, nuclear anti-satellite weapons (ASATs) became an extension of the Cold War nuclear arms race. However, they quickly revealed a destructive potential so large that the superpowers banned their use by treaty. After nuclear ASATs were banned, conventional ASATs took centre stage. Meanwhile, satellites proved to be highly valuable for spying and military force-enhancement, but they also became more vulnerable targets. In the 1980s, as the Cold War

¹⁰⁵² Sheehan. *The International Politics of Space*, p. 3.

was approaching its unforeseen end, large military space investments on both sides, but especially in the US, created yet another peak in the risk of space war. After the USSR collapsed, US unilateralism in space became a threat to less powerful states. In the last decades, China has challenged the US by investing newfound wealth, partly from its commercial space sector, in a wide range of military space capabilities, including operational ASATs with demonstrated destructive potential. The research question remains: why have the US, the USSR/Russia and China not overtly destroyed each others space assets through offensive action between 1957 and 2018?

In short, this thesis provides three answers. First, a neorealist analytical framework – the “toolkit” of the thesis – has proved that it can capture the essence of international space politics. The initial case for using a widely defined neorealism, encompassing defensive neorealism (DN), offensive neorealism (ON), power transition theory (PTT) and hegemonic stability theory (HST), was made already in the introduction. International space politics appeared to be a game played by the great powers on Earth, in which advanced, material, military capabilities is the main currency of authority. However, liberal and constructivist perspectives were also included at an early stage to expose the reader to other interpretations and provide justification for each step taken. The supporting argument was strengthened in Chapter I. A crash course on international space politics showed that there is no clear boundary between Earth and space. The most important space activities are conducted by the most powerful states either on Earth itself or in the orbits surrounding it. A literature review showed that all major IR paradigms have proved useful, but continue to clash in the study of international space politics. It revealed that neorealism can explain core dynamics in international space politics, but also revealed clear gaps in the existing IR literature on international space politics. Ultimately, a final case was made for basing the study on a widely defined neorealism. Just as international politics is the realm of IR, competition, conflict and war is the natural domain of realism. The discipline's dominant theoretical body, neorealism, produced clear and contrasting hypotheses with multiple shared assumptions, but essential differences. The first neorealist hypothesis, based on DN and ON, was that a bipolar balance of space power in the international system has decreased the risk of space war. The second neorealist hypothesis, based on PTT and HST, was that a preponderance of space power in the international system has decreased the risk of space war.

Second, a descriptive history of international space politics between 1957 and 2018 has revealed that international space politics is highly interconnected with international politics. The striking similarities between the history of international politics in space and on Earth implies that the causes of space war are closely related to the causes of war. The Space Age began as the Cold War superpower rivalry, born in the aftermath of WWII, carried over into space. Only two states,

the US and USSR, were initially able to compete. The historically weaker USSR was a first mover in space because it felt threatened, but the US quickly levelled the playing field. After the terror balance between two opposing international orders in space was codified in a new space regime in the spirit of *détente*, the risk of space war decreased. Gradually, the US overtook the USSR as the most powerful state in space. When the USSR collapsed, the US was the only space superpower left. Meanwhile, China had begun benefiting properly from long term investments in space capabilities dating back to the 1980s. Today, the US is still the most powerful state in space, but China's space power is growing rapidly. The familiar narrative strengthened the choice of IR theory, since neorealist theories were designed to study the history of international politics on Earth. If international politics in space and on Earth is deeply interlinked, the IR has a higher chance of being able to capture the object's essence. There is a high risk of space capabilities being used together with nuclear weapons and other military capabilities in a potential great power war. A conflict on Earth could escalate into space, or a space war could lead to war on Earth. Regardless, history shows that the causes of space war and great power conflict are related.

Third, a neorealist analysis of the history of international space politics has concluded that the distribution of space power among the US, the USSR/Russia and China has been prone to peace so far in the Space Age. The eclectic analysis has combined four different neorealist theories with a historical methodology to produce a complex causal explanation. Together they conclude that a space war has not occurred between 1957 and 2018 because the space power distribution in the international system has been bipolar and unipolar while no state has reached parity with the US in the underlying components of space power. The conclusion is the result of four neorealist analyses testing two neorealist hypotheses against historical evidence from the First and Second Space Age. In the First Space Age, a bipolar balance of space power – deeply interlinked with the bipolar balance of nuclear power – between the US and USSR decreased the risk of space war by creating a game that was easy to read and codify in the international space regime. In the transition between the First and Second Space Age, a US preponderance in the underlying components of space power decreased the risk of space war by making it too costly for the USSR to challenge the status quo – even though it initially was the most powerful state in space. In the Second Space Age and the ongoing transition into the Third Space Age, a US unipolarity of space power and its underlying components has decreased the risk of space war because no other state could afford to risk an attack in space. In addition, high cost and technological immaturity decreased the risk of space war by placing a constant limit on space activities. States seem more inclined to maximise space security than space power. Ultimately, China still seems to be challenging the US within the existing international order – at least partly.

The neorealist analysis further warns against a dangerous future in space. All four neorealist theories predict a more insecure distributions of space power and an increasing risk of space war in the Third Space Age. China is rapidly catching up with the US both in space power and the underlying components – and so are other powerful states. In other words, the distribution of space power in the international system is becoming more multipolar, and a rising challenger is approaching parity with the dominant one. Thus, according to both camps of neorealism, the world is entering a period with a higher risk for space war. The gradual shift to multipolarity has already increased the risk of space war during the Second Space Age. As the USSR collapsed, a US preponderance of space power increased insecurity in space for less powerful states in the international system. China and Russia therefore balanced against the US in space to be able to defend themselves through deterrence. Moreover, the quest for regional hegemony on Earth has increased the risk of space war. The risk of space war has increased because China is a partly dissatisfied challenger that wants to change or replace parts of the international space order dominated by the US. The risk has also increased because the US is trying to keep China from becoming the dominant state. If China's space power grows at speeds similar to those demonstrated in the last decades, the risk of space war will most likely increase in the future.

Finally, this thesis can hopefully inspire further research on international space politics. If this turns out to be a stepping stone for other students or scholars, there is still a wide gap to fill in the IR literature. Even neorealism, a prominent school within the dominant realist paradigm, has rarely been applied to the object. In that respect, this thesis is somewhat of an experiment. As it turns out, international space politics is not exogenous to international politics. Neorealism can be used to capture its essence. And the history of international politics in space and on Earth is largely the same. Nonetheless, the neorealist conclusion – that the distribution of space power has been prone to peace, but is growing more dangerous – makes competing theoretical perspectives more important than ever. The distribution of space power might be unfavourable, but liberalism and constructivism might produce more optimistic predictions on the likelihood of space war. Alternative perspectives and conclusions on international space politics, perhaps based on the descriptive history provided in this thesis, are highly needed to deal with humanity's common political future in space.

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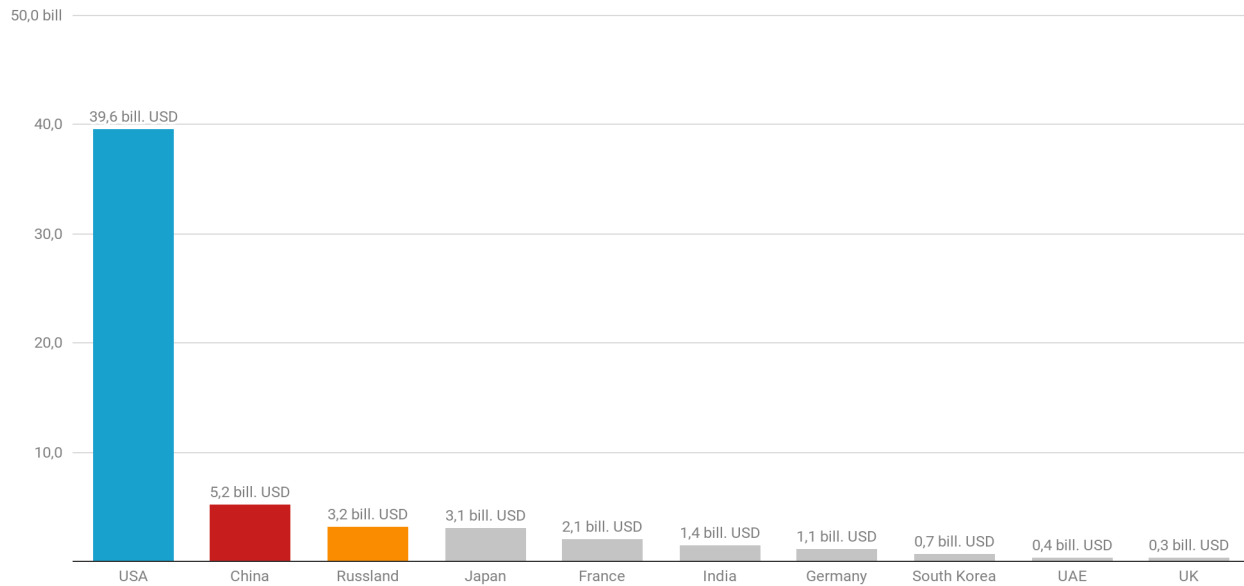
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FIGURES

FIGURE 1: Ten largest space budgets in 2018

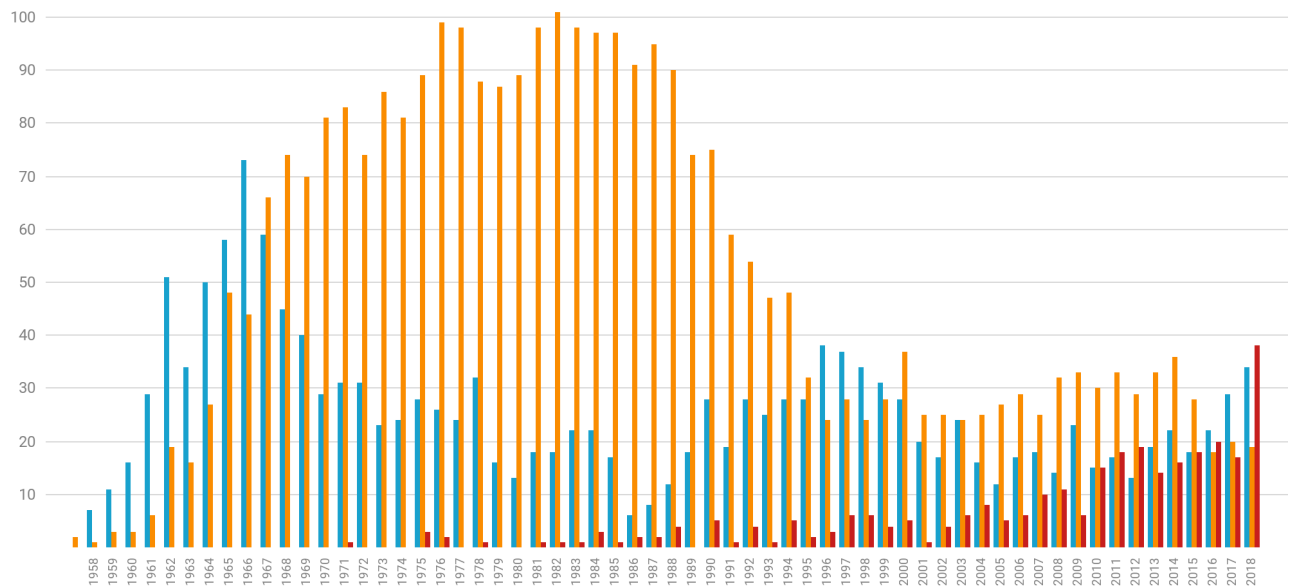
Excludes contributions to the European Space Agency for France, Germany, and UK.



Source: Shalal, Andrea. "Fly me to the moon: Germany eyes slice of lucrative space market." Reuters with Euroconsult, April 28, 2019. <https://graphics.reuters.com/SPACE-EXPLORATION-GERMANY/010091KW2C1/index.html>

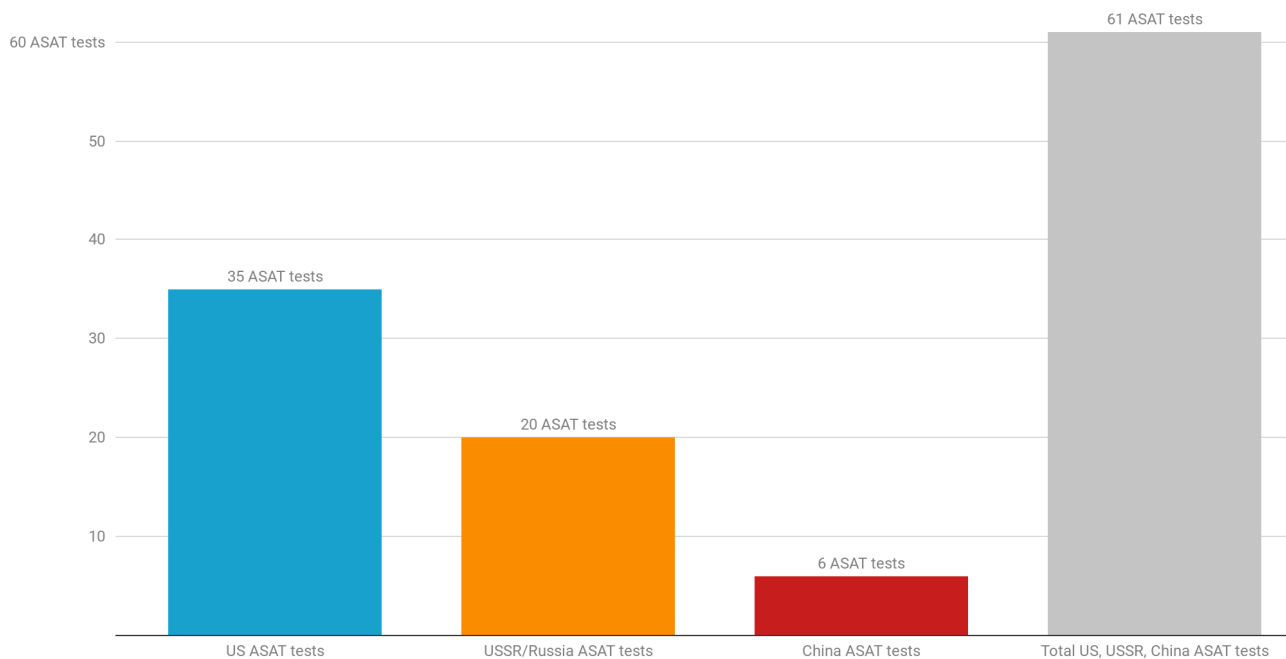
FIGURE 2: Payloads launched by the US, USSR/Russia and China between 1957 and 2018

■ US payloads ■ USSR/Russia payloads ■ China payloads



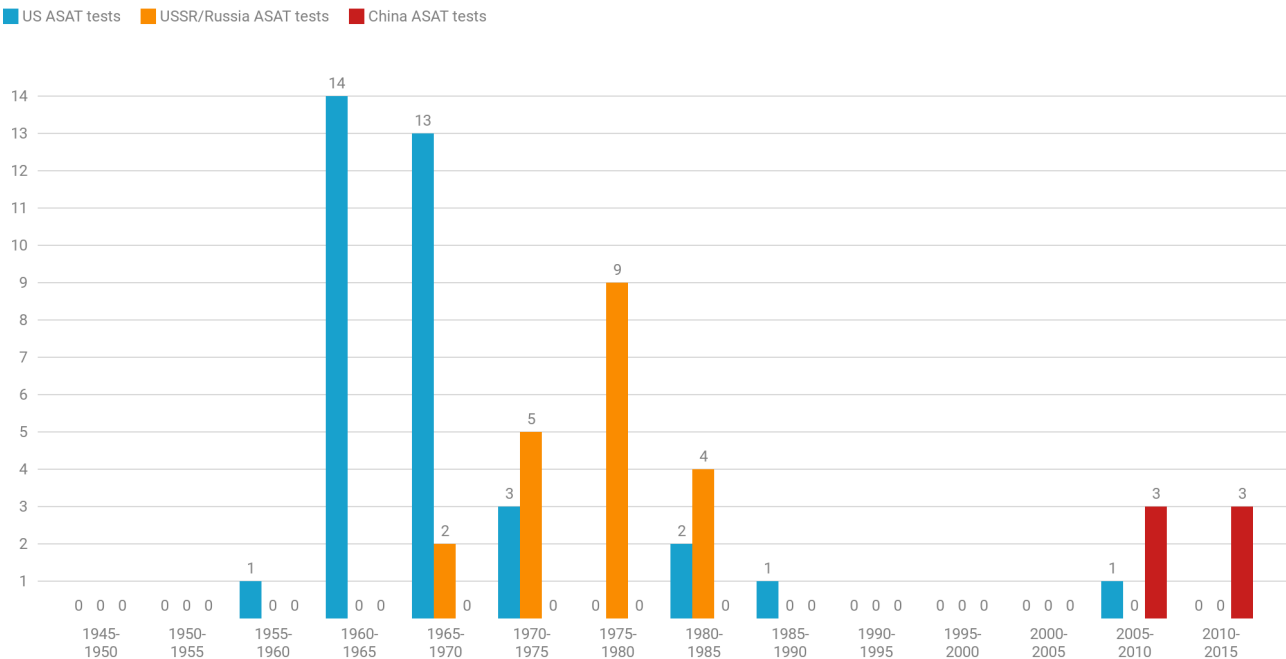
Source: Weeden, Brian and Victoria Samson, eds. *Global Counterspace Capabilities: An Open Source Assessment*. Washington, D.C.: Secure World Foundation, 2018.

FIGURE 3: Total ASAT tests by the US, USSR/Russia and China between 1945 and 2013



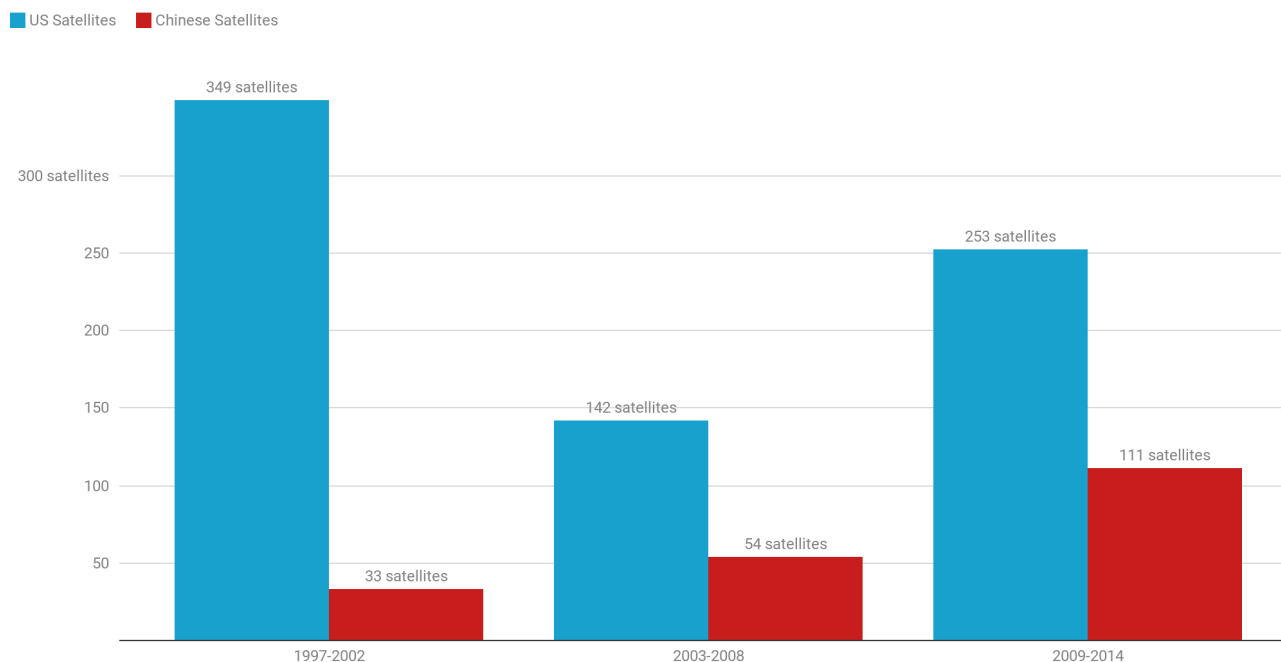
Source: Michael Krepon and Sonya Schoenberger. "Annex: A Comparison of Nuclear and Anti-Satellite Tests, 1945-2013." In *Anti-satellite Weapons, Deterrence and Sino-American Space Relations*, edited by Michael Krepon and Julia Thompson, 131-137. Washington, D.C.: Stimson Center, 2013.

FIGURE 4: ASAT tests by the US, USSR/Russia and China in 5-year periods between 1945 and 2013



Source: Michael Krepon and Sonya Schoenberger. "Annex: A Comparison of Nuclear and Anti-Satellite Tests, 1945-2013." In *Anti-satellite Weapons, Deterrence and Sino-American Space Relations*, edited by Michael Krepon and Julia Thompson, 131-137. Washington, D.C.: Stimson Center, 2013.

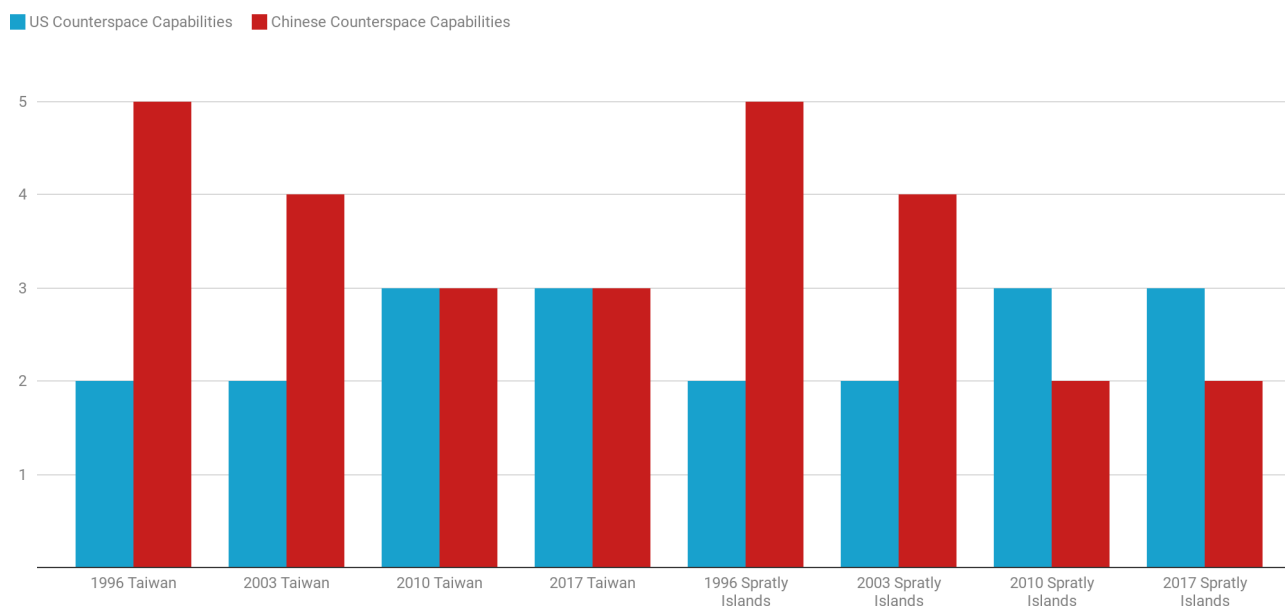
FIGURE 5: Satellites place in orbit by US and China in 5-year periods between 1997 and 2014



Source: Heginbotham, Eric and Michael Nixon, Forrest E. Morgan, Jacob L. Heim, Jeff Hagen, Sheng Li, Jeffrey Engstrom, Martin C. Libicki, Paul DeLuca, David A. Shlapak, David R. Frelinger, Burgess Laird, Kyle Brady, and Lyle J. Morris. *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017*. Santa Barbara: RAND Corporation, 2017.

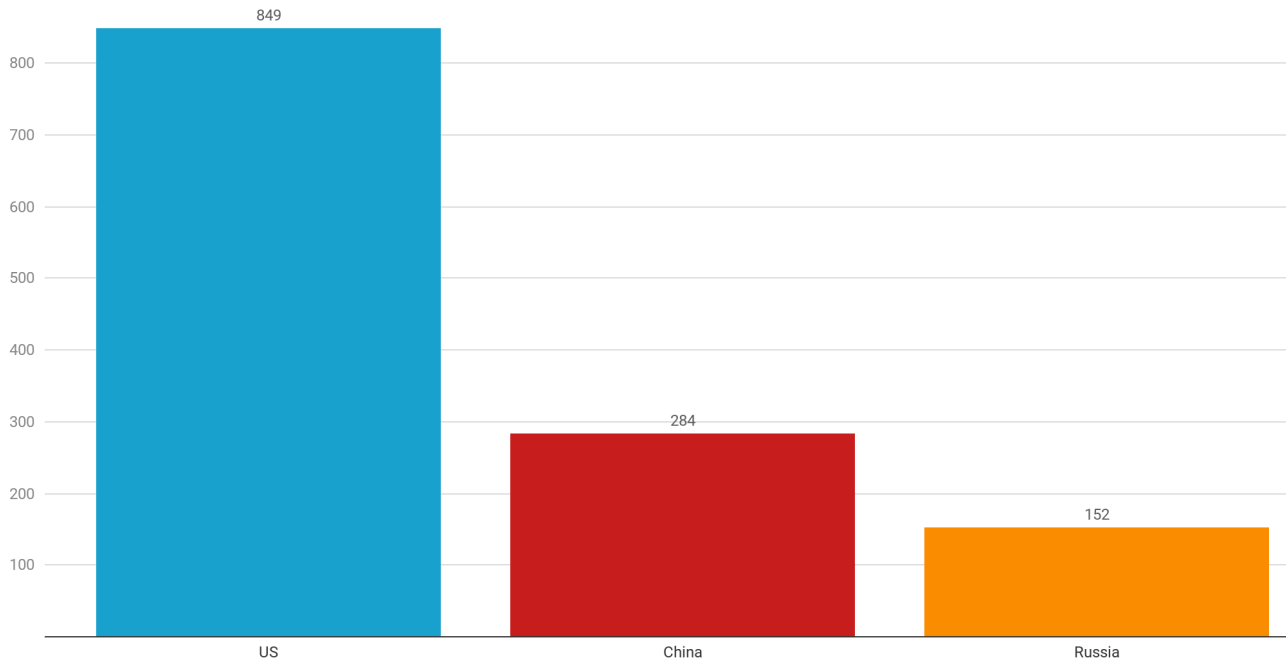
FIGURE 6: US vs. Chinese space capabilities in Taiwan and Spratley Islands war scenarios

5. US Major Advantage, China Major Disadvantage / 4. US Advantage, China Disadvantage / 3. Approximate Parity / 2. US Disadvantage - China Advantage / 1. US Major Disadvantage, China Major Advantage



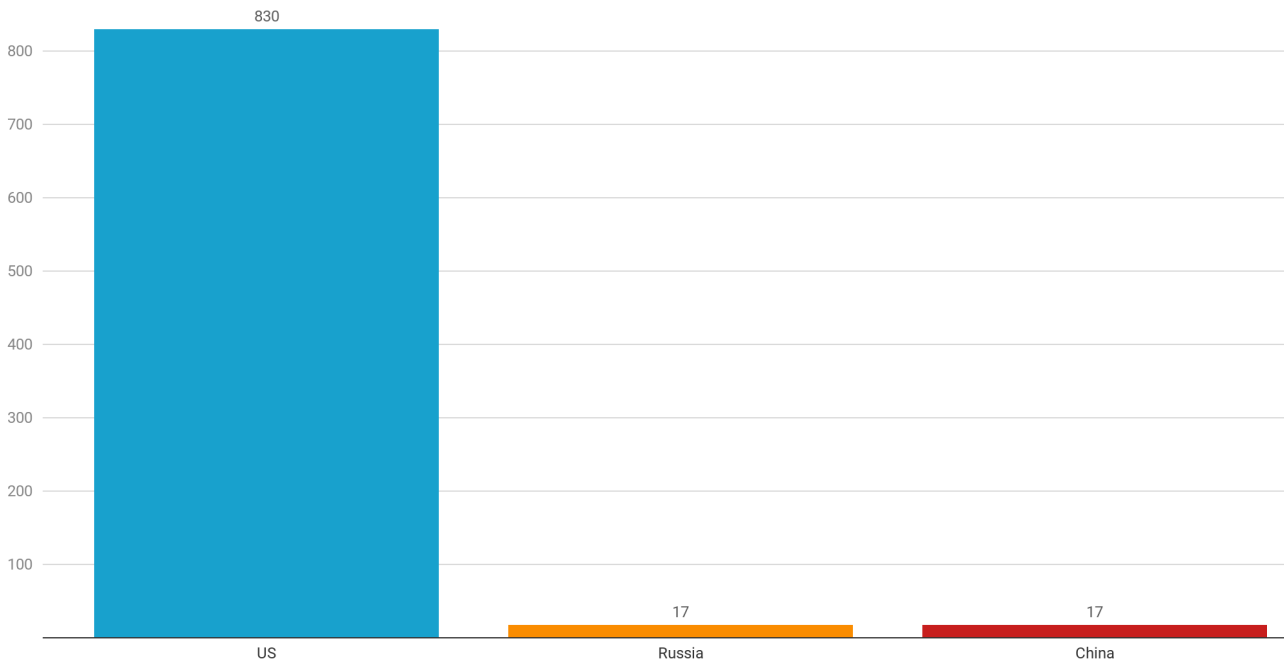
Source: Heginbotham, Eric and Michael Nixon, Forrest E. Morgan, Jacob L. Heim, Jeff Hagen, Sheng Li, Jeffrey Engstrom, Martin C. Libicki, Paul DeLuca, David A. Shlapak, David R. Frelinger, Burgess Laird, Kyle Brady, and Lyle J. Morris. *The U.S.-China Military Scorecard: Forces, Geography, and the Evolving Balance of Power 1996-2017*. Santa Barbara: RAND Corporation, 2017.

FIGURE 7: Satellites in orbit owned by US, Russia and China in 2018



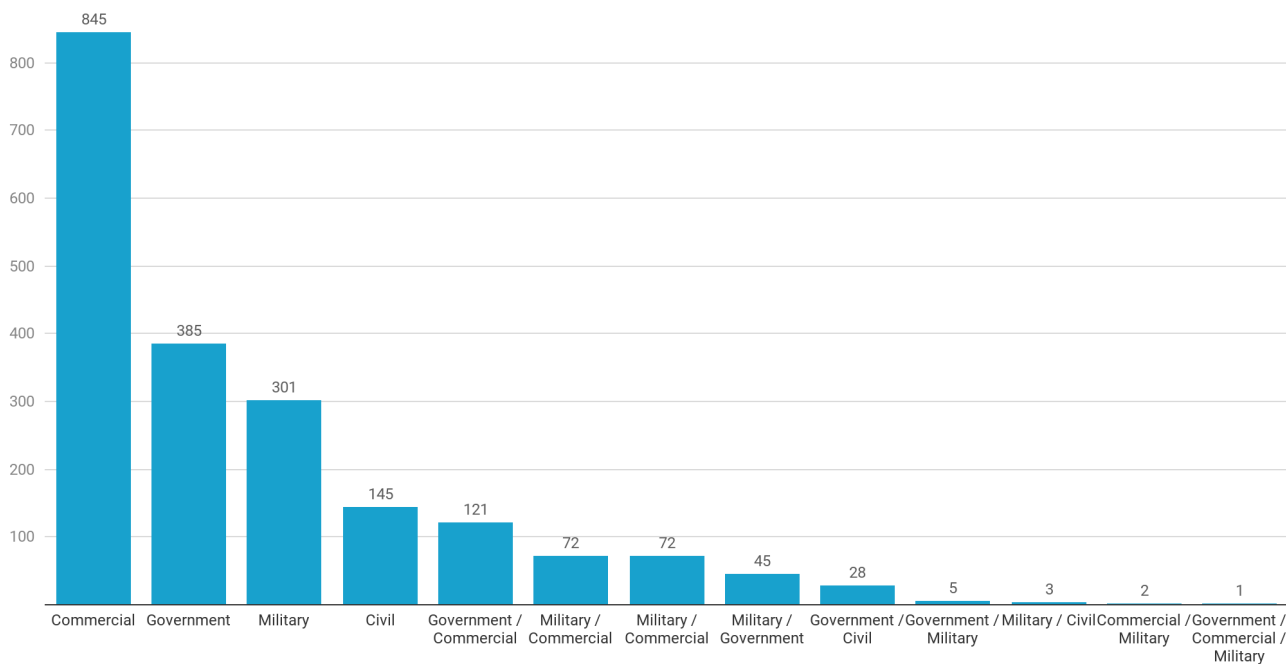
The data includes includes launches through 11/30/18.
Source: Union of Concerned Scientists. "UCS Satellite Database." Accessed April 27, 2019. <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WLAqnRKLR-U>

FIGURE 8: Satellites in orbit with contractor from only US, Russia and China in 2018



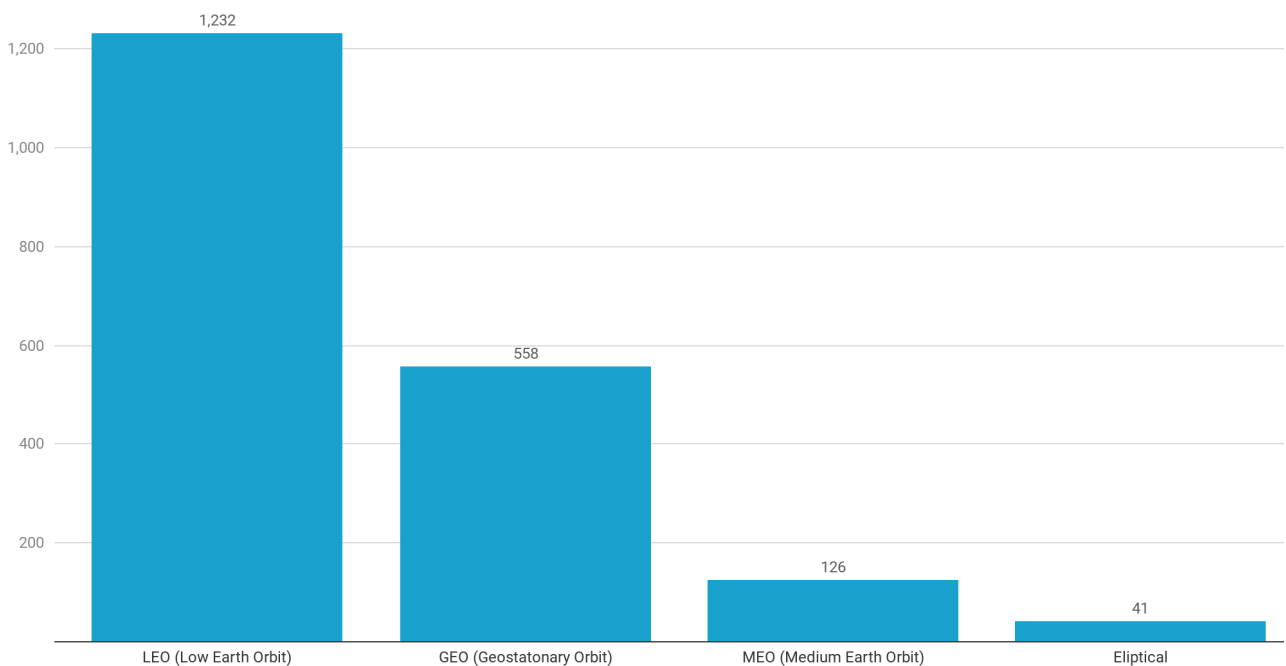
The data includes includes launches through 11/30/18.
Source: Union of Concerned Scientists. "UCS Satellite Database." Accessed April 27, 2019. <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WLAqnRKLR-U>

FIGURE 9: Satellites in orbit by type in 2018



The data includes includes launches through 11/30/18.
Source: Union of Concerned Scientists. "UCS Satellite Database." Accessed April 27, 2019. <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WLAqnRKLR-U>

FIGURE 10: Satellites in different orbits in 2018



The data includes includes launches through 11/30/18.
Source: Union of Concerned Scientists. "UCS Satellite Database." Accessed April 27, 2019. <http://www.ucsusa.org/nuclear-weapons/space-weapons/satellite-database#.WLAqnRKLR-U>